"THE IMPACT OF ENVIRONMENTAL BARRIERS AND THEIR RELATION TO PHYSICAL ABILITY & SOCIAL PARTICIPATION OF POST-STROKE HEMIPLEGIC INDIVIDUALS: A CROSS-SECTIONAL STUDY"

Registration No.27112303

A Dissertation Submitted to

THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY

CHENNAI – 600 032

In partial fulfillment of the requirement for the degree of

MASTER OF PHYSIOTHERAPY

ELECTIVE: ADVANCED PHYSIOTHERAPY IN NEUROLOGY

April 2013

"THE IMPACT OF ENVIRONMENTAL BARRIERS AND THEIR RELATION TO PHYSICAL ABILITY & SOCIAL PARTICIPATION OF POST-STROKE HEMIPLEGIC INDIVIDUALS: A CROSS-SECTIONAL STUDY"

Registration No.27112303

MOHAMED SATHAK A. J. COLLEGE OF PHYSIOTHERAPY

CHENNAI – 600 034

A Dissertation Submitted to

THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY

CHENNAI – 600 032

In partial fulfillment of the requirement for the degree of

MASTER OF PHYSIOTHERAPY

ELECTIVE: ADVANCED PHYSIOTHERAPY IN NEUROLOGY

April 2013

"THE IMPACT OF ENVIRONMENTAL BARRIERS AND THEIR RELATION TO PHYSICAL ABILITY & SOCIAL PARTICIPATION OF POST-STROKE HEMIPLEGIC INDIVIDUALS: A CROSS-SECTIONAL STUDY"

Registration No. 27112303

GUIDE

Prof. K.HARI OHM, MPT.(Neuro),

Mohamed Sathak A. J. College

of Physiotherapy, Chennai - 34

PRINCIPAL

Prof. B.NARMADHA, MPT.,

Mohamed Sathak A. J. College

of Physiotherapy, Chennai - 34

Examiners:

_____ _____

Internal **External**

A Dissertation Submitted to

THE TAMILNADU Dr. M.G.R. MEDICAL UNIVERSITY

CHENNAI – 600 032

In partial fulfillment of the requirement for the degree of

MASTER OF PHYSIOTHERAPY

ELECTIVE: ADVANCED PHYSIOTHERAPY IN NEUROLOGY

April 2013

DECLARATION

I hereby present and declare my dissertation titled

"THE IMPACT OF ENVIRONMENTAL BARRIERS AND THEIR RELATION TO PHYSICAL ABILITY & SOCIAL PARTICIPATION OF POST-STROKE HEMIPLEGIC INDIVIDUALS: A CROSS-SECTIONAL STUDY"

Is the outcome of original research work, undertaken and carried out by me, under the guidance of **Prof. K. HARI OHM, MPT., (Neurology)** Mohamed Sathak A. J. College Of Physiotherapy, Chennai.
I also declare that the material of this dissertation has not formed in any way the basis for the award of any other degree previously from The Tamil Nadu Dr. M.G.R. Medical University, Chennai - 32.

Registration No.27112303

ACKNOWLEDGEMENT

I thank the **Gracious GOD** who has guided me and helped me all through my life successfully.

I have great pleasure to express my gratitude and thanks to our beloved Principal **Prof. B. Narmadha, MPT.,** for her valuable advice and encouragement.

I express my very special thanks to the Academic Advisor **Prof. S. Rajalakshmi, MPT.**, for helping me to initiate and carry out the project.

I thank our **Management** for providing sufficient books and good faculties and facilities for us to gain more knowledge in the Physiotherapy field.

I express my sincere gratitude & heartfelt thanks to my Guides **Prof. K. Hari Ohm, MPT.,** and **Asst. Prof. N. Deepa, MPT.,** for their wonderful guidance throughout the project.

My heartfelt thanks to my teachers**, Asst. Prof. V. Suchitra, MPT., Asst. Prof. S. Srinivasan, MPT.,** and **Asst. Prof. T. Arthi, MPT.,** for their encouraging and motivating support.

Also my special thanks to **Dr.Esther Lydia Ph.D.** and **Prof.K.Veerapandian M.A., M.Phil.** for their timely help and guidance on Statistics and Research methodologies needed for the project.

I dedicate my work to my beloved parents **Mr.V.Rajkumar** and **Mrs.R.Grace**. I also express my loving thanks to my sister **Ms.R.Sheeba Rachel** and my beloved friend **Ms.R.Divya**, for their moral support in the preparation of my project.

I take immense pleasure in thanking all the Institutes and Rehabilitation centers for their willingness to permit me for the data collection, all my college staffs, my friends, my seniors & juniors and all the participants in my study, who co-operated well to finish the project.

Registration No.27112303

LIST OF ABBREVIATIONS

- **EB** : Environmental Barriers
- **CHIEF – LF** : Craig Hospital Inventory of Environmental Factors – Long Form
- **LSNS** : Lubben Social Network Scale
- **BI** : Barthel Index

CONTENTS

LIST OF TABLES

LIST OF FIGURES

ANNEXURES

INTRODUCTION

1. INTRODUCTION

Stroke is characterized by a focal loss of brain function which may lead to dysfunctions in the physical abilities, cognition & perception of the affected individual. Stroke is a major health problem and a cause of long-term disability. World-wide, 15 million people experience a stroke every year, 5 million of which result in permanent disability [1]. Stroke is a life-changing event that affects not only the person who may be disabled, but also their family and caregivers [2]. Effective screening, evaluation, and management strategies for stroke are well established in high-income countries [3], but these strategies have not been fully implemented in India [4]. A stroke can have a devastating effect not only on a person's physical function but also on their perceptual abilities like encountering environmental factors. This study explores the difficulties of people with stroke as they encounter various factors in their environment that are problematic. This needs to be addressed for an effective rehabilitation incorporating the stroke patients' varied problems.

Incidence and Prevalence rates:

World-wide over the past four decades, the annual age-standardized stroke incidence rates has been decreased by 1.1 percent in high-income countries, on the other hand it has increased by 5.3 percent in low to middle income counties [5]. In India, it is estimated that the number of strokes will increase from 1,081,480 in 2000 to 1,667,372 by 2015 [6]. Also, it has estimated that a population-based annual stroke incidence of India to be 89/100,000 in 2005, which is projected to increase to 91/100,000 by 2015 and to 98/100,000 by 2030 [7]. Stroke increases with age: the prevalence rates increases from 21/100,000 for the 20-40 age group to 625/100,000 in the age group of over 60 years [8]. Also men are more likely to have a stroke than women: the male: female sex ratio for India is 7:1, which may be [9] due to differences in risk factors such as smoking and drinking, which are more prevalent among men in India compared with women [10]. From these facts, we could infer that more number of people are being affected with stroke and the chances are still increasing in our region. Thus, larger group of people are living their lives with their residual physical dysfunctions in our society.

Disability Adjusted Life Years (DALY):

In 1997, it was estimated that 28.5 million DALYs were lost due to stroke worldwide. This is projected to increase to 61 million DALYs by 2020, of which 84 percent of these DALYs lost will be in developing countries [11]. In South East Asia alone, where India comprises 81% of the population, 6.36 million DALYs are estimated to be lost due to stroke [12]. Hence the need for the post-stroke individuals to be an active participant of the society is necessary, even with his physical impairments for the rest of his life. And the environment, in which the stroke individual lives, imposes a number of barriers for his activities.

Disability as a "social" problem:

Disability was considered as a physical entity, but now the understanding of "Disability" is complex, dynamic, multidimensional and contested. Responses to disability have changed drastically and it has now more often being seen as a human right issue [13]. Policy have now shifted towards community and educational inclusion, and medically-focused solutions have given way to more interactive approaches recognizing that people are disabled by "environmental factors" as well as their bodies [14]. This transition from an individual, medical perspective to a structural, social perspective has been described as the shift from "medical model" to "social model" in which people are being disabled by social barriers rather than by their bodies. But disability shouldn't be viewed as purely social or purely medical [15]. A balanced approach is thus needed, giving appropriate weight to different aspects of disability and a need for shift in our focus on stroke patient's social problem of overcoming his environmental barriers is also much needed.

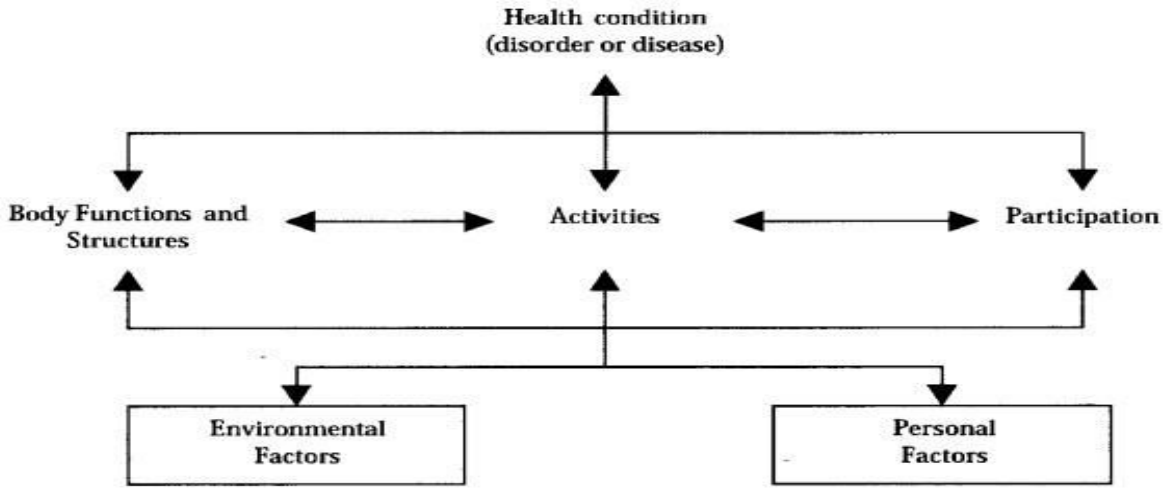
"Bio-psycho-social model" by World Health Organization (WHO):

Several models of disablement have been put forth by the WHO, but most of them lacked to cover all the dimensions of a disabled individual. Recently, the ICF (WHO) promoted the "Bio-psycho-social model", which understands the functioning and disability as a dynamic interaction between health conditions and contextual factors both personal and environmental factors [16]. Disability results from the interaction between persons with impairments and "attitudinal & environmental factors", which hinders their full and effective participation in the society on an

equal basis with others. Progress on improving social participation can be made by addressing these contextual "barriers" which hinders persons with disabilities in their day to day lives [17].

Environment: A person's environment has a huge impact on the extent and experience of disability. Inaccessible environment create disability by creating barriers to participation. An example of the possible negative impact of environment could be a wheelchair user in a building without an accessible bathroom or lift. Environmental factors include a wider set of issues rather simply as physical and information access. Policies and service delivery systems, including the rules underlying service provision can also be barriers. The important social determinant of health has been, "inequality is a major cause of disability" [18].

Participation: Negative attitudes, behaviors and barriers have an adverse effect on the disabled, leading to negative consequences such as low self-esteem and reduced participation. Reduced participation can lead to restriction of activities and confinement of disabled to their home and on the whole makes their life more disabled [19]. This needs to be countered well by rehabilitation in eliminating the barriers to participation and thus help the disabled in living a near normal functional life.



"Bio-Psycho-Social" Model of World Health Organization (WHO) (International Classification of Functioning, Disability & Health) WHO, 2011

According to the International Classification of Functioning (ICF) developed by World Health Organization (WHO), the interaction between the individual and the environment plays a key role in determining the level of social participation. The ICF is universal because it covers all human functioning and treats disability as a continuum rather than categorizing people with disabilities as a separate group (WHO, 2008).

Environmental Factor assessing instruments:

A measure which could be used to assess these environmental factors is therefore needed so that a clearer understanding of the affecting environmental barriers could be obtained from stroke participants. Several instruments are available to measure the environmental factors, of which, the measures which assesses environment using the ICF framework are obtained. Environmental factors can be quantified as either "environmental facilitators" (factors that increase participation) or "environmental barriers" (factors that decrease participation). A review was done, which founded about totally 8 instruments, that measures the environmental factors [20]. The 8 Instruments are as follows:

1. Community health environment checklist (CHEC)
2. Craig hospital inventory of environmental factors (CHIEF)*
3. Facilitators and barriers survey (FABS)
4. Home and community environment instrument (HACE)
5. Individually prioritized problem assessment (IPPA)
6. Measure of the quality of the environment (MQE)
7. Neighborhood environment walk-ability scale (NEWS)
8. ICF checklist

The * CHIEF instrument was used in our study, which contains concepts related to 5 Environmental Factor (EF) chapters of ICF as follows:

1. Products and technology
2. Natural environment
3. Support and relationships
4. Attitudes
5. Services, systems and policies

CHIEF and FABS satisfies the criteria for measuring the EF, of which the CHIEF instrument is used in this study to measure the environmental barriers because of its higher relevance to ICF categories and assesses the frequency and intensity of EF impact on the disabled individuals. Also the CHIEF questionnaire is brief and takes only minimal time to administer with feasible number of items as compared to FABS (61 items) or MQE (81 items). The CHIEF demonstrated good psychometric properties in samples of people with and without disabilities [21, 22].

1.1 NEED FOR THE STUDY

The influence of environment as a major factor in the outcome of a disabled has been shown by the ICF model and further data are required to explore the barriers faced by post-stroke patients in their environment. The needs for the study are briefed as follows:

- Identifying the environmental barriers which are acting as a potential restriction for social participation of the post-stroke hemiplegics.
- Estimating the level of physical disability and its relation to environmental barriers and participation restriction.
- Limited data availability on environmental barriers for stroke in Indian context.
- Emphasizing on the importance of community participation by the disabled stroke individuals to be an active member of the society.
- Importance of improving physical ability & eliminating environmental barriers for the disabled stroke patients to promote their effective participation in the society.
- Designing or modifying the environment suitable for accessibility, minimizing obstacles and effective rehabilitation to ensure maximal participation by the stroke individuals.

1.2 OBJECTIVES OF THE STUDY

- To determine the level of environmental barrier's impact on the post-stroke participants.
- To determine the frequency, magnitude and overall impact of environmental barriers perceived by post-stroke participants.
- To identify the significant environmental barrier of the post-stroke participants.
- To determine the level of physical ability and participation of post-stroke hemiplegics
- To estimate the relationship between physical ability, environmental barriers and participation of post-stroke hemiplegic individuals
- To estimate the relationship between post-stroke hemiplegic participants' demographic profile with environmental barriers, physical disability and social participation.

1.3 OPERATIONAL DEFINITIONS

1. **Environmental Factor:** Environment describes the world in which people with different levels of functioning must live and act. Environmental factor includes the natural & built environment, products & technology, support & relationships, attitudes and services & policies. These factors can either be facilitators or barriers. [18]

2. **Physical Disability:** Disability refers to difficulties encountered in any or all 3 areas of functioning: impairments (problems or alterations in body structure and function), activity limitation (difficulties in executing activities) and participation restriction (problems with involvement in any area of life). [18]

3. **Social Participation:** Social Participation is the newest term for "community re-integration". Participation is defined as involvement in a life situation. To participate, a person may not necessarily need to be without assistance and symptom free. This approach helps to understand the area of participation restriction faced by the disabled and thus emphasizes the individual's personal goals, requiring their involvement in the planning and decision-making. Participation involves returning to previous activities which were and still are important for a stroke survivor. [18]

2. **REVIEW OF LITERATURE**

- Urimubenshi G et al., (2011)[23], concluded that the 3 major themes of environmental barriers experienced by their stroke participants were social, physical and attitudinal barriers. The subthemes included were lack of social support and inaccessible physiotherapy services for social barriers; in-accessible pathways and toilets for physical barriers and negative attitudes of others towards them for attitudinal barriers. The findings of this study, highlights the importance of finding the environmental barriers faced by stroke patients in our region and the necessity in overcoming them.

- Swann J, (2008)[24], stated that barriers hinder a person's rehabilitation and reintegration. Barriers can also be prejudice, inaccessible information, inflexible organizational procedures and buildings & transport. Also the problems of stroke patients in coping with the environment should not be overlooked.

- Beard JR., (2009)[25], and Freedman VA., et al, (2008)[26], stated that, features of the community environment such as housing density, the number of residential and commercial buildings, socio-economical advantage and disadvantage, residential stability and street pattern are associated with disability.

- Louise et al., (2009)[64], concluded that by improving stroke survivor's walking ability, it is likely also to improve their general well-being by promoting better health and greater community participation. So if these achievements can be self sustaining this will greatly increase life satisfaction and also decrease burden of family and economic care.

- Clarke P et al., (2008)[26], found out a positive relationship between environment and disability by comparing the disabled individuals encounter into various qualities of street conditions. He stated that built environment has a greater effect on mobility disability for those with existing lower extremity impairment.

- Verbrugge LM et al., (1994)[27], explained that if street quality could be improved, even somewhat, for those adults with a greater risk of disability, the disablement process could be reversed or attenuated and hence are better able to meet their social needs.

- Hammel J, (2006)[28], reported in his study that people with disabilities encountered more barriers in community participation than in home & transport or mobility settings. Majority of people used environmental supports (accessibility, social & system) to meet their goals. Participation was about being included rather than having it done for them.

- Vincent et al., (2007)[29], stated that personal and environmental factors influence a stroke survivor's ability to engage in social participation. They reported that these factors strongly influence a disabled individual's participation in social activities.

- Black et al., (2005)[30], found that stroke patients reported that they could no longer engage in activities (travelling, reading, gardening) they previously enjoyed and also notable factors like inability to drive or engage in their careers are reported.

- Keysor J et al., (2005)[31], emphasizes the impact of environmental factors as barriers or facilitators to effective mobility and highlights the relationship between various levels of community mobility and the level of community participation and social integration that a person experiences in his environment.

- Levasseur et al., (2004)[32], examined the relationship between self perceived environment and subjective quality of life of a group of older adults with physical disability living in the community. The social environment was found more important than physical.

- Keysor JJ et al., (2006)[33], concluded that people with functional limitations who live in communities that were more restrictive felt more limited in doing daily activities but did not perform these daily activities any less frequently. This makes us to understand that, despite the barriers, people with disabilities frequently encounter them.

- Reid D, (2004)[34], found out that the immediate physical environment, for example, negotiating access throughout the house has a major influence over the functioning of stroke survivors. In some instances, Stroke people are even forced to leave their homes and reside elsewhere as they encountered more environmental barriers (Rowles, 1987)[39].

- Woollacott and Shumway - Cook A, (2002)[35], stated that, walking in the real world is highly complex, requiring cognitive flexibility to address motor requirements, while attending to a range of environmental stimuli or concurrent tasks. This opens up a new

dimension for us to consider the interaction of environment with the people affected by stroke to help improve our knowledge on their needs and requirements.

- Shumway - Cook, et al., (2003)[36], suggested that mobility barriers are clearly present in the community for disabled and older adults. They frequently reports difficulties with physical elements of their environment.

- ICF framework (WHO, 2001)[16], advanced the understanding and measurement of disability. It stated that functioning and disability is a dynamic interaction between health condition and contextual factors. And argued that inequality is the major cause and environmental change is needed to overcome these disabilities.

- Patla A & Shumway – Cook A, (1999)[41], suggested that physical requirements associated with community mobility are complex and should not be limited. They presented a conceptual model in which attributes of physical environment a grouped into 8 dimensions as: distance, time, ambient conditions, terrain characteristics, physical load, attentional demands, postural transitions and traffic level. These demands have to be met for an individual to be mobile within a particular environment.

- Duncan PW, (1994)[38], stated that, estimating and understanding disability following stroke should be a high priority in health care. To better characterize the stroke related disability, physical therapists should use a conceptual model of disablement and measure functions across all domains of disablement.

- Rom J.M. Perenboom et al., (2003)[41], included Lubben Social Network Scale as one of the instruments that measures social participation according to ICF categories.

- Sangha H et al., (2005)[61], concludes that BI and FIM were the most common measures of disability for stroke. However Barthel Index was used more often and cited in trials of superior quality as compared to the FIM scale.

In summary, the literature reviews present us with difficulties faced by the disabled stroke individual with respect to environmental context and its subsequent restriction in social participation. However reports from Indian contexts are still lacking.

3. METHODOLOGY

1. **Study design:** a Cross-section observational study.
2. **Sampling design:** Convenient sampling.
3. **Study setting:** Community and clinical based collection of samples from Chennai.
4. **Study duration:** One time administration [Time taken: 45 minutes approximately]
5. **Sample size:** 80 samples of post-stroke hemiplegics determined from the sample size calculator with a confidence interval of 95 percent and population size of 90.

6. Inclusion criteria:

1. Age: ≥ 45 years
2. Gender: male & female
3. Duration: > 6 months post – stroke
4. Community dwelling
5. Ambulatory capacity (Functional ambulatory Capacity of ≥ 3) [42]
6. No significant cognitive deficits (Abbreviated Mental Test score ≥ 6)
7. Lived in the place for at least 1 year at the time of data collection
8. Discharged from the hospital at least 6 months prior [44]
9. Taking regular trips (≥3 trips / week) into the community (alone / accompanied) [44]

7. Exclusion criteria:

1. Severe aphasia
2. Severe visual problems (that require assisted walking)
3. Lower limb related problems that hinders ambulation
4. Serious illnesses that restrict participation
5. Other co-morbid neurological conditions

8. OUTCOME MEASUREMENTS:

1. **Craig Hospital Inventory of Environmental Factors - Long Form (CHIEF-LF) :**
   CHIEF-LF is a 25 item questionnaire that estimates the frequency, magnitude and overall impact of perceived environmental barriers by the stroke individuals. CHIEF measures the barriers that limit functioning of an individual within the household & community and from doing what they need or want to do. (Harrison-felix, 2001)

2. **Barthel Index (BI):**
   BI estimates the level of physical functioning of disabled individuals, consisting of 10 items. BI measures an individual's activities of daily living and mobility. BI is the more often used measure for estimating the physical ability of hemiplegic stroke individuals and cited in trials of superior quality. (Mahoney and Barthel, 1965)

3. **Lubben Social Network Scale (LSNS):**
   LSNS is a measure of social support levels of the disabled individuals. LSNS is a 10-item questionnaire with total scores based on the stroke participants' ratings are categorized as 4 grades of risk for social isolation. (Lubben JE, 1988)

9. VARIABLES MEASURED:

1. Environmental Barriers
2. Physical Ability
3. Social Participation
4. Demographic profile (Age, Gender, Occupation, Economy, Living place, Affected side of stroke and Post-stroke duration)

4. PROCEDURE

A required number of participants were recruited in to the study from the target group of post - stroke hemiplegic individuals, based on the eligibility criteria. The informed consent was got from the participants regarding their participation in the study and data were collected from them in detail, by in-person interview at one stage.

The data which were collected from the post-stroke participants includes:

1. Basic demographic profile (age; gender; place of living; occupation; economic status and stroke characteristics - duration & side of paresis)

2. Barthel Index (comprising of 10 items with a total score range of 1-100)

3. Craig Hospital Inventory of Environmental Factors – LF (comprising of 25 questions with scores on frequency (0 – 4), magnitude (0 – 2) & overall impact (0 – 8) of the environmental barriers for each of the items)

4. Lubben Social Network Scale (comprising of 10 questions with total score range of 0-50)

CHIEF is the measure of environmental barriers, which was developed by the Craig Hospital Research Department, Englewood, CO. The original CHIEF scale is the CHIEF-LF, which consists of 25 items and a modified version which is the CHIEF - Short Form (SF) consisting of 12 items. In this study the CHIEF – LF was used, so that detailed information could be assessed. CHIEF consists of 5 domains as "physical or structural, assistance or services, work, attitudinal or support & policy barriers". Participants were asked the 25 questions and two responses were got for each of the questions. First response: "Frequency (F)" (0 - never, 1 - less than monthly, 2 - monthly, 3 - weekly, 4 – daily) of perceiving those barriers and the second response: "Magnitude (M)" (1 – little problem, 2 – big problem) of the problem when it occurs. The overall "Impact (I)" score (0 to 8) were calculated by the product of frequency score by magnitude score ($I = F \times M$). Items relating to work, where the participants are not- working are checked as "not applicable". Respective scores on each of the CHIEF – LF's 5 domains and total were calculated based on the mean of all non-missing responses. The CHIEF – LF has an acceptable validity and reliability for its use in the study.

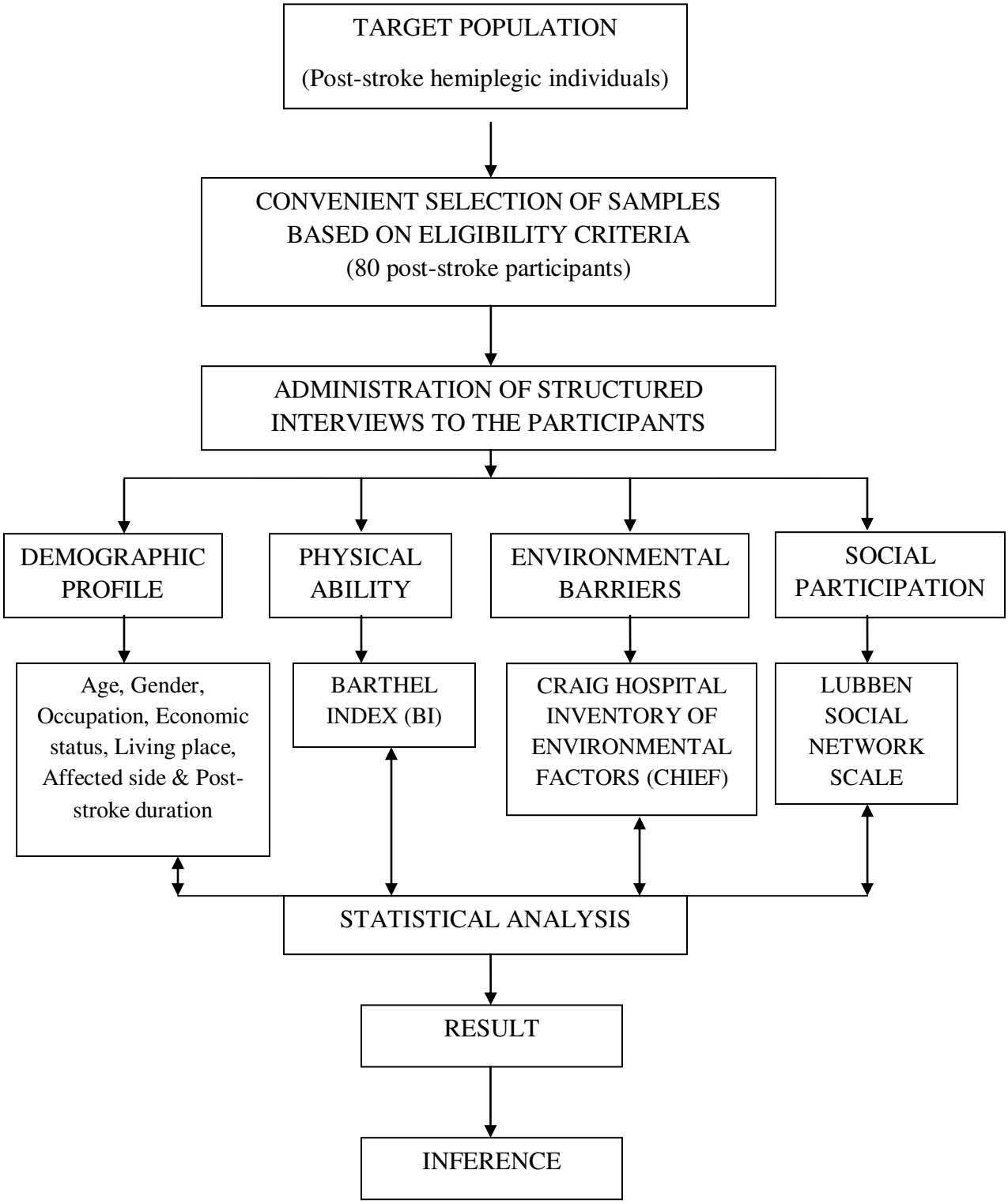
Barthel Index comprises of 10 items: feeding, bathing, grooming, dressing, bladder, bowel, toilet use, transfer, mobility & stairs. Participants were asked questions on those 10 activities and are rated, based on the amount of assistance required to complete each of those activities. For each item the scores may range from 0, 5, 10, 15 and the total score across all the items of BI was calculated by sum of all the scores of each item and the total score range obtained can be from 0 to 100 with higher scores indicating higher Physical Ability (higher functional independence).

Lubben Social Network Scale consists of 5 domains as family networks (3), friend networks (3), confident relationships (2), helping others (1) and living arrangements (1). Based on the responses, outcome points range from 0 to 5 for each of the 10 items. The total score is calculated by the sum of all the points of 10 items. The total score obtained will be in the range of 0 to 50 with interpretation of final score ranges as follows: Isolated (< 20), High risk for Isolation (21–25), Moderate risk for Isolation (26–30), Low risk for Isolation (≥ 31).

Both the Barthel Index and Lubben SNS have an acceptable level of validity and reliability. The level of physical ability can be estimated from Barthel Index and the level of participation restriction can be estimated from Lubben Social Network Scale. (Nina, 2012)[55] (Sansoi, 2010)[53]

Similarly, the data were collected across the required number of 80 post-stroke hemiplegic participants and statistical analysis was done.

FLOW CHART OF PROCEDURES INVOLVED IN THE STUDY



ENVIRONMENTAL FACTORS THAT INFLUENCES A PERSON IN THE SOCIETY
(Crowded places, improper roads / sidewalks, lack in services & transportation, etc.)

5. DATA ANALYSIS & INTERPRETATION

Descriptive statistics were used for the statistical analysis of the obtained scores:

Cut-off values: For statistical analysis, the total CHIEF-LF scores obtained were dichotomized with a score of 2 was made the cut-off value for the obtained overall impact scores. The scores < 2 indicates "less infrequent barriers" and the scores > 2 indicating "more substantial barriers". Similarly, for the BI total scores that indicate a favorable outcome, the score of 90 (sensitivity 90.7%; specificity 88.1%) was made as cut-off and dichotomized with BI score < 90 indicating "low physically able" and "high physically able" [54]. For the LSNS total score the cut-off values were (< 20) "isolated", (21–25) "high risk", (26–30) "moderate risk" and (≥ 31) for "low risk".

The demographic profiles are grouped as follows: The participants Age were grouped into 3: 45 – 55 years; 56 – 65 years and > 65 years. The Gender grouped into 2 as male and female. The Occupational status was categorized into 2 as either working or not working. The Economic status was categorized into 3 as per the LIC norms as High, Middle & Low Income groups. Place of Living was categorized into 2 as Rural and Urban. The Stroke characteristics taken into account mainly are the Participants Affected side as either Left or Right and the Duration of post-stroke is categorized either as < 1 year or > 1 year after an attack of stroke causing functional impairments of one side of the body.

STATISTICAL ANALYSIS: SPSS 15.0 was used for statistical analysis. The mean values for all of the 80 participants score for frequency, magnitude and impact of CHIEF-LF domains and total were calculated to find out the significant environmental barrier and the overall presence of those environmental barriers among them, respectively. Independent sample t – test was used to find out the significant difference, first between scores of CHIEF-LF, BI, LSNS with the 5 of the two-grouped demographic data [gender, occupation, living place, side affected, post-stroke duration] and the next t-test for scores of CHIEF-LF with BI. ANOVA (Analysis Of Variance) test was used to find out the significant difference for more than 2 grouped variables, first between scores of CHIEF-LF, BI, LSNS with the 2 of the three-grouped demographic data [age and economic status] and the next ANOVA test for scores of CHIEF-LF with LSNS. Pearson correlation was used to find out the relationship between scores of CHIEF-LF, Lubben SNS, Barthel Index and also with age, economic status and post-stroke duration.

6. RESULTS

This study aims to find out the environmental barriers for post-stroke hemiplegic participants and its relation to their physical ability, social participation. A cross-sectional survey was conducted among 80 post-stroke participants using a structured questionnaire incorporating basic demographic profile, CHIEF-LF, Barthel Index and Lubben Social Network Scale.

The demographic characteristics of the post-stroke participants are presented in the Table 1 & 2 and Figure 1. Participants in the study were distributed with a mean age of 59.33 ± 8.57.

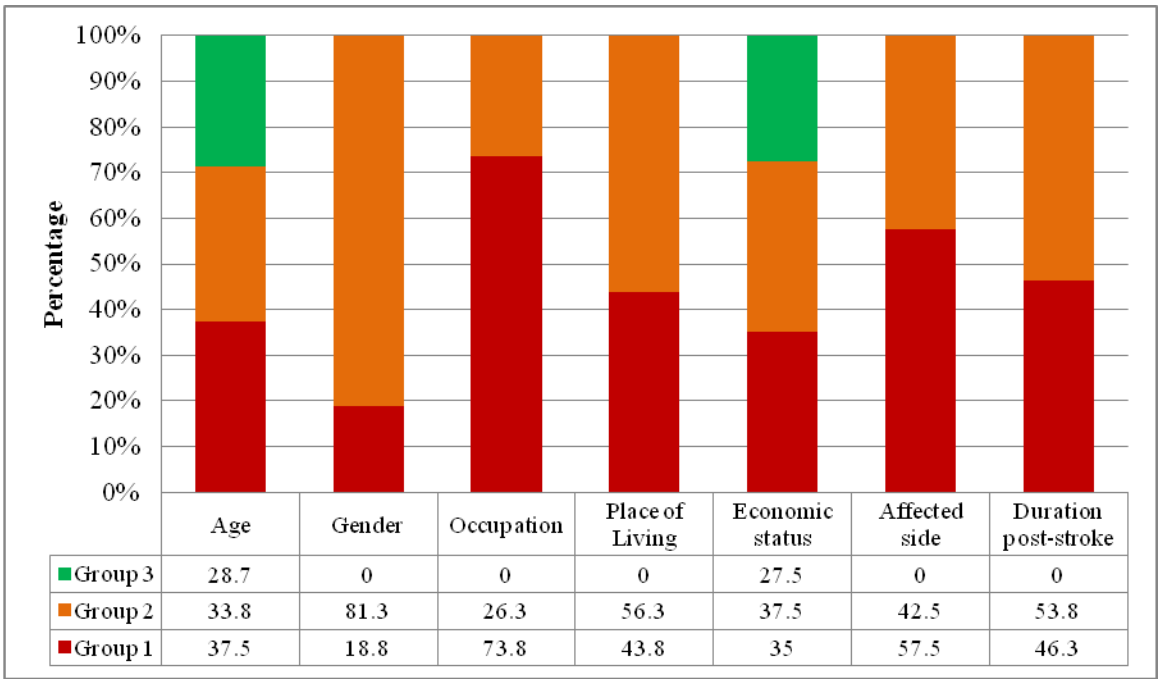
TABLE 1: Mean age of participants in the study

Particular	N	Minimum	Maximum	Mean ± Std. Deviation
Age	80	45	78	59.33 ± 8.57

TABLE 2: Frequency distribution of demographic profile of the participants

S.No.	Particulars	Groups	Frequency (n=80)	Percent (%)
1	**Age**	45 – 55 years	30	37.5
		56 -65 years	27	33.8
		> 65 years	23	28.7
2	**Gender**	Female	15	18.8
		Male	65	81.3
3	**Occupation**	Not Working	59	73.8
		Working	21	26.3
4	**Place of living**	Rural	35	43.8
		Urban	45	56.3
5	**Economic status**	Low income	28	35.0
		Middle income	30	37.5
		High income	22	27.5
6	**Affected side**	Left	46	57.5
		Right	34	42.5
7	**Duration**	> 1 year	37	46.3
		< 1 year	43	53.8

From the frequency distribution table, we can elicit that higher percentage (37.5 %) of participants were in the age range of 45 – 55 years and were males (81.3 %) and were not working (73.8 %). The participants were equally distributed in rural & urban areas (around 50 %). Higher percentage (37.5%) of participants were in the middle income group and most of the participants had their affected side as left (57.5 %), with a majority having a post-stroke duration of < 1 year (53.8 %).



	Age	Gender	Occupation	Place of Living	Economic status	Affected side	Duration post-stroke
Group 3	28.7	0	0	0	27.5	0	0
Group 2	33.8	81.3	26.3	56.3	37.5	42.5	53.8
Group 1	37.5	18.8	73.8	43.8	35	57.5	46.3

FIGURE 1: Demographic profile of the post-stroke participants

Frequency, magnitude and impact of environmental barriers: The frequency distribution of environmental barriers perceived and that of of their total scores (score range: 0 – 8) by post-stroke participants are presented in the Table 3 & 4 and Figure 2 & 3, respectively. Assessment of environmental barriers for the post-stroke participants using CHIEF-LF indicates that majority of the participants have perceived more substantial environmental barriers (71.3 %) around which, about higher percentage (27.5 %) of participants had their mean CHIEF-LF total scores in the range of 3 to 4 followed by 23.75 percent of participants having total score range of 1 to 2. Markedly, about 10 percent of the participants in the study reported total score range of 5 to 6 which is an alarming obstacle to social participation.

TABLE 3 & FIGURE 2: Frequency distribution of perceived environmental barriers among the post-stroke participants using CHIEF-LF

Environmental Barriers	Frequency	Percent (%)
Less Infrequent Barriers	23	28.7
More Substantial Barriers	57	71.3
Total	80	100.0

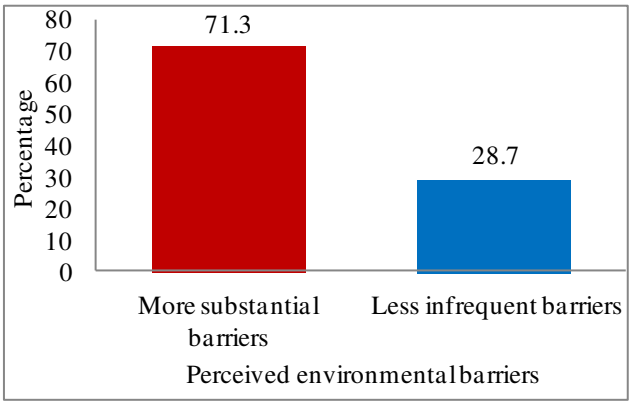
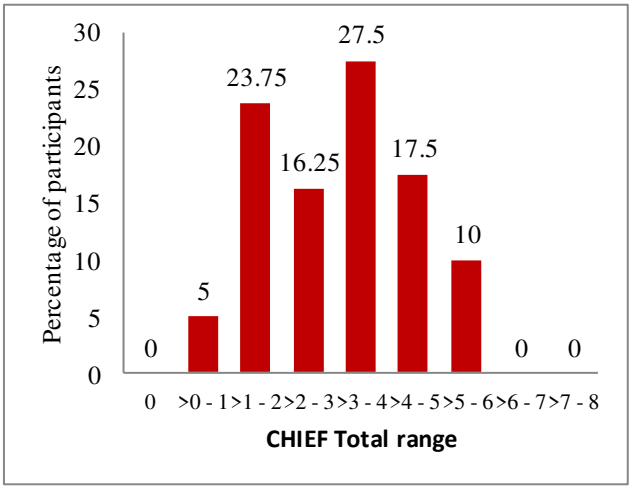


TABLE 4 & FIGURE 3: Frequency distribution of CHIEF-LF total scores

CHIEF Total	Frequency	Percent (%)
0	0	0
>0-1	4	5
>1-2	19	23.75
>2-3	13	16.25
>3-4	22	27.50
>4-5	14	17.50
>5-6	8	10
> 6-7	0	0
> 7-8	0	0
Total	80	100.0



Assessment of the 5 sub-scales of CHIEF-LF among post-stroke participants are presented in Table 5 and Figure 4, which revealed a higher mean impact score (3.74 ± 1.71) for physical and structural barriers followed by work barriers (3.14 ± 1.63) and service and assistance barriers (3.01 ± 1.37) with a reported mean impact score of more than 3 while comparatively lower mean scores were reported in policy barriers (2.62 ± 1.35) and attitude & support barriers (2.23 ± 1.18) with a mean impact score of less than 3 on a total scale of 8.

Further in-depth assessment of the frequency and magnitude of the 5 sub-scales of CHIEF-LF, revealed a marked higher mean score (2.38 ± 0.89) for the frequency of perceiving those

physical and structural barriers followed by both the work and service & assistance barriers with a mean score of around 1.80. While the frequency of perceiving policy and attitude barriers are comparatively low as 1.56 ± 0.69 and 1.36 ± 0.65 respectively on a total scale of 4. On the other hand the magnitude of the barrier, which determines the intensity of the barrier revealed a different score from the frequency as work barrier with a mean score of 1.52 ± 0.41 is the highest followed by policy, physical and service barriers with a mean score of around 1.40, while attitude barrier with a mean score of 1.28 ± 0.50 is the lowest on a total scale of 2.

TABLE 5: Mean scores of frequency, magnitude and impact of environmental barriers using CHIEF-LF (sub-scales & total)

S.No.	CHIEF - LF		N	Mean ± Std. Deviation
1	**Physical / Structural Barrier**	Frequency	80	2.38 ± 0.89
		Magnitude	80	1.40 ± 0.28
		Impact	80	3.74 ± 1.71
2	**Services / Assistance Barrier**	Frequency	80	1.80 ± 0.69
		Magnitude	80	1.39 ± 0.37
		Impact	80	3.01 ± 1.37
3	**Work Barrier**	Frequency	21	1.81 ± 0.72
		Magnitude	21	1.52 ± 0.41
		Impact	21	3.14 ± 1.63
4	**Attitudes / Support Barrier**	Frequency	80	1.36 ± 0.65
		Magnitude	80	1.28 ± 0.50
		Impact	80	2.23 ± 1.18
5	**Policies Barrier**	Frequency	80	1.56 ± 0.69
		Magnitude	80	1.41 ± 0.44
		Impact	80	2.62 ± 1.35
6	**CHIEF Total**	Frequency	80	1.78 ± 0.72
		Magnitude	80	1.40 ± 0.40
		Impact	80	2.94 ± 1.44

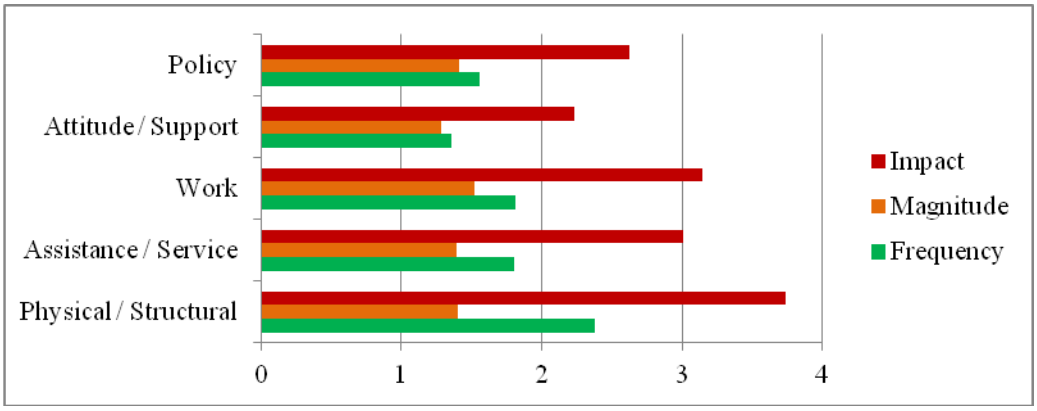


FIGURE 4: Mean scores of frequency, magnitude and impact of environmental barriers using CHIEF-LF (sub-scales)

Assessment of physical ability and social participation: The Barthel Index and Lubben social network scale respectively, reported frequency distribution scores, are presented in the Table 6 & 7 and Figure 5 & 6. The Barthel Index reported a higher percent (63.7%) of participants are low physically able (BI < 90), while the remaining percent of participants (36.3%) are high physically able (> 90). LSNS revealed that higher percent of participants were on a higher risk for isolation with more than half of the participants (55%) reported either as Isolated (27.5%) or High risk for Isolation (27.5%). While 16.3 percent and 28.7 percent of participants are in Moderate risk and Low risk of Isolation, respectively.

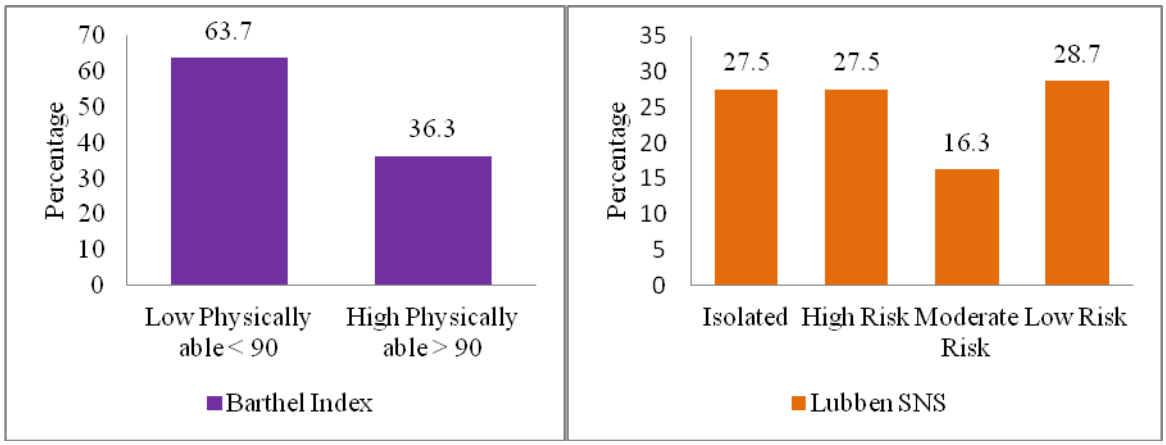


FIGURE 5 & 6: Frequency distribution of physical ability & social participation outcome using BI & LSNS, respectively

TABLE 7: Frequency distribution of physical ability using Barthel Index

Physical Ability	Frequency	Percent (%)
Low Physically able (< 90)	51	63.7
High Physically able (> 90)	29	36.3
Total	80	100.0

TABLE 8: Frequency of social participation outcome from LSNS

LSNS Outcome	Frequency	Percent (%)
Isolated	22	27.5
High Risk for Isolation	22	27.5
Moderate Risk for Isolation	13	16.3
Low Risk for Isolation	23	28.7
Total	80	100.0

Gender analysis with study variables: Analysis of mean difference between the CHIEF-LF total and gender of the participants are tabulated in Table 8.1. The test of significance reveals that there is a significant difference ($p < 0.002$) (ci = 95%) for the CHIEF-LF total between male (2.78 ± 1.18) and female (3.90 ± 1.29) participants. Female participants perceived significantly higher environmental barriers compared to male participants. Similarly, analysis of mean difference between BI and gender of the participants are tabulated in Table 8.2. The test of significance reveals that there is a significant difference ($p < 0.007$) (ci = 95%) for the BI between male (84.76 ±10.05) and female (76.66 ±10.46) participants. Male participants are significantly more physically able compared to female participants. Also, analysis of mean difference between LSNS and gender of the participants are tabulated in Table 8.3. The test of significance reveals that there is a significant difference ($p < 0.006$) (ci = 95%) for the LSNS between male (27.72 ± 8.80) and female (20.86 ± 7.07) participants. Male participants had significantly reduced isolation or more social participation compared to female participants.

TABLE 8.1: Mean Difference of Environmental Barriers between male and female post-stroke participants

Scale	Gender	N	Mean ± Std. Deviation	t-test	Level of significant
Physical / Structural	Male	65	3.46 ±1.61	3.20	0.002**
	Female	15	4.95 ±1.65		
Services / Assistance	Male	65	2.80 ±1.30	3.06	0.003**
	Female	15	3.94 ±1.32		
Work	Male	20	3.08 ±1.64	0.74	0.468^{NS}
	Female	1	4.33 ±0.00		
Attitude / Support	Male	65	2.03 ±1.09	3.25	0.002**
	Female	15	3.08 ±1.23		
Policies	Male	65	2.40 ±1.23	3.15	0.002**
	Female	15	3.56 ±1.48		
CHIEF Total	Male	65	2.78 ±1.18	3.27	0.002**
	Female	15	3.90 ±1.29		

TABLE 8.2 Mean Difference of physical ability between male & female post-stroke participants

Scale	Gender	N	Mean ± Std. Deviation	t-test	Level of significant
Barthel Index	Male	65	84.76 ±10.05	2.79	0.007**
	Female	15	76.66 ±10.46		

TABLE 8.3 Mean Difference of social participation between male and female post-stroke participation

Scale	Gender	N	Mean ± Std. Deviation	t-test	Level of significant
Lubben SNS	Male	65	27.72 ± 8.80	2.81	0.006**
	Female	15	20.86 ± 7.07		

Occupational status analysis with study variables: Analysis of mean difference between the CHIEF-LF total and occupational status of the participants are tabulated in Table 9.1. The test of significance reveals that there is a significant difference ($p < 0.000$) (ci = 95%) for the CHIEF-LF total between not-working (3.44 ±1.14) and working (1.74 ±0.60) participants. Not-working participants perceived significantly higher environmental barriers compared to working participants. Similarly, analysis of mean difference between BI and occupational status of the participants are tabulated in Table 9.2. The test of significance reveals that there is a significant difference ($p < 0.000$) (ci = 95%) for the BI between not-working (79.57 ±9.34) and working (93.57 ±5.94) participants. Working participants are significantly more physically able compared to not-working participants. Also, analysis of mean difference between LSNS and occupational status of the participants are tabulated in Table 9.3. The test of significance reveals that there is a significant difference ($p < 0.000$) (ci = 95%) for the LSNS between not-working (22.86 ±6.73) and working (36.47 ±6.06) participants. Working participants had significantly reduced isolation or more social participation compared to not-working participants.

TABLE 9.1: Mean Difference of Environmental Barriers between working and not-working post-stroke participants

Scale	Occupation	N	Mean ±Std. Deviation	t-test	Level of significance
Physical / Structural	Not Working	59	4.45 ±1.39	8.58	0.000**
	Working	21	1.75 ±0.52		
Services / Assistance	Not Working	59	3.58 ±1.11	8.60	0.000**
	Working	21	1.41 ±0.47		
Work	Not Working	0[a]	NC	NC	NC
	Working	21	3.14 ±1.63		
Attitude / Support	Not Working	59	2.69 ±1.00	7.71	0.000**
	Working	21	0.93 ±0.49		
Policies	Not Working	59	3.03 ±0.30	5.32	0.000**
	Working	21	1.45 ±0.63		
CHIEF Total	Not Working	59	3.44 ±1.14	6.47	0.000**
	Working	21	1.74 ±0.60		

a. t test cannot be computed because one of the groups is empty; NC. Not Computed

TABLE 9.2 Mean Difference of physical ability between working and not-working post-stroke participants

Scale	Occupation	N	Mean ± Std. Deviation	t-test	Level of significance
Barthel Index	Not Working	59	79.57 ±9.34	6.40	0.000**
	Working	21	93.57 ±5.94		

TABLE 9.3 Mean Difference of social participation between working & not-working post-stroke participants

Scale	Occupation	N	Mean ± Std. Deviation	t-test	Level of significance
Lubben SNS	Not Working	59	22.86 ±6.73	8.15	0.000**
	Working	21	36.47 ±6.06		

Living place analysis with study variables: Analysis of mean difference between the CHIEF-LF total and living place of the participants are tabulated in Table 10.1. The test of significance reveals that there is a significant difference ($p < 0.000$) (ci = 95%) for the CHIEF-LF total between rural (3.99 ± 0.84) and urban (2.21 ± 0.97) participants. Rural participants perceived significantly higher environmental barriers compared to urban participants. Similarly, analysis of mean difference between BI and living place of the participants are tabulated in Table 10.2. The test of significance reveals that there is a significant difference ($p < 0.000$) (ci = 95%) for the BI between rural (75.14 ± 6.12) and urban (89.55 ± 8.84) participants. Urban participants are significantly more physically able compared to rural participants. Also, analysis of mean difference between LSNS and living place of the participants are tabulated in table 10.3. The test of significance reveals that there is a significant difference ($p < 0.000$) (ci = 95%) for the LSNS between rural (20.02 ± 4.93) and urban (31.42 ± 8.04) participants. Urban participants had significantly reduced isolation or more social participation compared to rural participants.

TABLE 10.1: Mean Difference of Environmental Barriers between rural and urban dwelling post-stroke participants

Scale	Living place	N	Mean ± Std. Deviation	t-test	Level of significance
Physical / Structural	Rural	35	5.06 ± 1.09	8.27	0.000**
	Urban	45	2.72 ± 1.36		
Services / Assistance	Rural	35	4.06 ± 0.83	8.13	0.000**
	Urban	45	2.19 ± 1.14		
Work	Rural	2	5.00 ± 0.47	1.78	0.091*
	Urban	19	2.94 ± 1.58		
Attitude / Support	Rural	35	3.06 ± 0.94	7.08	0.000**
	Urban	45	1.58 ± 0.91		
Policies	Rural	35	3.62 ± 1.17	7.67	0.000**
	Urban	45	1.84 ± 0.90		
CHIEF Total	Rural	35	3.99 ± 0.84	8.55	0.000**
	Urban	45	2.21 ± 0.97		

TABLE 10.2 Mean Difference of physical ability between rural & urban dwelling post-stroke participants

Scale	Living place	N	Mean ± Std. Deviation	t-test	Level of significance
Barthel Index	Rural	35	75.14 ± 6.12	8.22	0.000**
	Urban	45	89.55 ± 8.84		

TABLE 10.3 Mean Difference of social participation between rural & urban Dwelling post-stroke participants

Scale	Living place	N	Mean ± Std. Deviation	t-test	Level of significance
Lubben SNS	Rural	35	20.02 ± 4.93	7.36	0.000**
	Urban	45	31.42 ± 8.04		

Affected side of stroke analysis with study variables: Analysis of mean difference between the CHIEF-LF total and affected side of the post-stroke participants are tabulated in Table 11.1. The test of significance reveals that there is a significant difference ($p < 0.000$) (ci = 95%) for the CHIEF-LF total between right (4.16 ± 0.74) and left (2.13 ± 0.80) side affected participants. Right side affected participants perceived significantly higher environmental barriers compared to left side affected participants. Similarly, analysis of mean difference between BI and affected side of the participants are tabulated in Table 11.2. The test of significance reveals that there is a significant difference ($p < 0.000$) (ci = 95%) for the BI between right (73.82 ±5.08) and left (90.21 ±7.74) side affected participants. Left side affected participants are significantly more physically able compared to right side affected participants. Also, analysis of mean difference between LSNS and affected side of the participants are tabulated in Table 11.3. The test of significance reveals that there is a significant difference ($p < 0.000$) (ci = 95%) for the LSNS between right (19.08 ±3.65) and left (31.87 ±7.60) side affected participants. Left side affected participants had significantly reduced isolation or more social participation compared to right side affected participants.

TABLE 11.1: Mean Difference of Environmental Barriers between Right & Left Side Affected post-stroke participants

Scale	Side affected	N	Mean ± Std. Deviation	t-test	Level of significance
Physical / Structural	Right	34	5.33 ± 0.89	11.78	0.000**
	Left	46	2.57 ± 1.12		
Services / Assistance	Right	34	4.24 ± 0.73	10.75	0.000**
	Left	46	2.10 ± 0.97		
Work	Right	1	5.33 ± 0.00	1.41	0.174^{NS}
	Left	20	3.03 ± 1.59		
Attitude / Support	Right	34	3.18 ± 0.87	8.59	0.000**
	Left	46	1.52 ± 0.84		
Policies	Right	34	3.82 ± 1.03	10.60	0.000**
	Left	46	1.72 ± 0.73		
CHIEF Total	Right	34	4.16 ± 0.74	11.54	0.000**
	Left	46	2.13 ± 0.80		

TABLE 11.2 Mean Difference of physical ability between Right & Left Side Affected post-stroke participants

Scale	Affected side	N	Mean ±Std. Deviation	t-test	Level of significance
Barthel Index	Right	34	73.82 ±5.08	10.74	0.000**
	Left	46	90.21 ±7.74		

TABLE 11.3 Mean Difference of social participation between Right & Left Side Affected post-stroke participants

Scale	Affected side	N	Mean ±Std. Deviation	t-test	Level of significance
Lubben SNS	Right	34	19.08 ±3.65	9.05	0.000**
	Left	46	31.87 ±7.60		

Duration post-stroke analysis with study variables: Analysis of mean difference between the CHIEF-LF total and post-stroke duration of the participants are tabulated in Table 12.1. The test of significance reveals that there is a significant difference ($p < 0.000$) (ci = 95%) for the CHIEF-LF total between participants < 1 year (3.92 ± 0.74) and > 1 year (1.91 ± 0.81) post-stroke. Participants < 1 year post-stroke perceived significantly higher environmental barriers compared to participants > 1 year post-stroke. Similarly, analysis of mean difference between BI and post-stroke duration of the participants are tabulated in Table 12.2. The test of significance reveals that there is a significant difference ($p < 0.000$) (ci = 95%) for the BI between participants < 1 year (75.23 ± 5.11) and > 1 year (92.56 ± 6.93) post-stroke. Participants > 1 year post-stroke are significantly more physically able compared to participants < 1 year post-stroke. Also, analysis of mean difference between LSNS and post-stroke duration of the participants are tabulated in Table 12.3. The test of significance reveals that there is a significant difference ($p < 0.000$) (ci = 95%) for the LSNS between participants < 1 year (19.88 ±3.43) and > 1 year (34.05 ±6.96) post-stroke. Participants > 1 year post-stroke had significantly reduced isolation or more social participation compared to participants < 1 year post-stroke.

TABLE 12.1: Mean Difference of Environmental Barriers between < 1 Year and > 1 Year Post-Stroke Duration participants

Scale	Post-stroke duration	N	Mean ± Std. Deviation	t-test	Level of significant
Physical / Structural	< 1 year	43	5.04 ± 0.92	12.70	0.000**
	> 1 year	37	2.24 ± 1.04		
Services / Assistance	< 1 year	43	4.07 ± 0.70	13.60	0.000**
	> 1 year	37	1.77 ± 0.81		
Work	< 1 year	1	5.33 ± 0.00	1.41	0.174^{NS}
	> 1 year	20	3.03 ± 1.59		
Attitude / Support	< 1 year	43	3.02 ± 0.79	9.26	0.000**
	> 1 year	37	1.31 ± 0.85		
Policies	< 1 year	43	3.50 ± 1.03	8.82	0.000**
	> 1 year	37	1.59 ± 0.88		
CHIEF Total	< 1 year	43	3.92 ± 0.74	11.55	0.000**
	> 1 year	37	1.91 ± 0.81		

TABLE 12.2 Mean Difference of physical ability between < 1 Year and > 1 Year Post-Stroke Duration participants

Scale	Post-stroke duration	N	Mean ±Std. Deviation	t-test	Level of significant
Barthel Index	< 1 year	43	75.23 ± 5.11	12.83	0.000**
	> 1 year	37	92.56 ± 6.93		

TABLE 12.3 Mean Difference of social participation between < 1 Year and > 1 Year Post-Stroke Duration participants

Scale	Post-stroke duration	N	Mean ± Std. Deviation	t-test	Level of significant
Lubben SNS	< 1 year	43	19.88 ±3.43	11.79	0.000**
	> 1 year	37	34.05 ±6.96		

Age group analysis with study variables: Analysis of variance (ANOVA) testing was used for analysis of age of the post-stroke participants and CHIEF-LF total, BI, LSNS are presented in the Tables 13.1, 13.2 and 14.1, 14.2 and 15.1, 15.2. Analysis of variance revealed that there is a significant variation ($p < 0.000$) (ci = 95%) in the CHIEF-LF total score among participants belonging to different age groups of 45-55; 56-65; > 65 years. Post-hoc Duncan tests revealed that participants in the age group of > 65 years had a higher mean score (4.09) for perceiving environmental barrier compared to mean score of their counterparts of 45-55 years (2.00) and 56-65 years (3.16). Also, ANOVA between BI and age groups revealed that there is a significant variation ($p < 0.000$) (ci = 95%) in the BI among participants belonging to different age groups as above. Post-hoc Duncan tests revealed that participants in the age group of 45-55years had a higher mean score (91.83) for high physically able compared to their counterparts of > 65 years (75.43) and 56-65 years (80.37). Similarly ANOVA between LSNS and age groups revealed that there is a significant variation ($p < 0.000$) (ci = 95%) in the LSNS among participants belonging to different age groups as above. Post-hoc Duncan tests revealed that participants in the age group of 45-55years had a higher mean score (33.90) for reduced isolation or more social participation compared to their counterparts > 65 years (19.34) and 56-65 years (24.18).

TABLE 13.1: ANNOVA between Environmental Barriers and age of post-stroke participants

Scale	Groups	Sum of Squares	df	Mean Square	F	Sig.
CHIEF Total	Between Groups	57.83	2	28.91	31.70	0.000**
	Within Groups	70.21	77	0.91		
	Total	128.04	79			

TABLE 13.2 Post Hoc Duncan Test for Homogeneous Subsets of the above

Scale	Age	N	Subset for alpha = 0.05			Significant
			1	2	3	
CHIEF Total	45-55 years	30	2.00			1.000
	56-65 years	27		3.16		1.000
	>65 years	23			4.09	1.000

Used harmonic mean sample size = 26.35

TABLE 14.1: ANNOVA between Physical ability and age of post-stroke participants

Scale	Groups	Sum of Squares	df	Mean Square	F	Sig.
Barthel Index Total	Between Groups	3838.88	2	1919.44	29.76	0.000**
	Within Groups	4966.11	77	64.49		
	Total	8805.00	79			

TABLE 14.2 Post Hoc Duncan Test for Homogeneous Subsets of the above

Scale	AGE	N	Subset for alpha = 0.05			Significant
			1	2	3	
BARTHEL Index Total	>65 years	30	75.43			1.000
	56-65 years	27		80.37		1.000
	45-55 years	23			91.83	1.000

Used harmonic mean sample size = 26.35

TABLE 15.1: ANNOVA between social participation and age of post-stroke participants

Scale	Groups	Sum of Squares	df	Mean Square	F	Sig.
Lubben SNS Total	Between Groups	2963.69	2	1481.84	34.89	0.000**
	Within Groups	3269.99	77	42.46		
	Total	6233.68	79			

TABLE 15.2 Post Hoc Duncan Test for Homogeneous Subsets of the above

Scale	AGE	N	Subset for alpha = 0.05			Significant
			1	2	3	
LUBBEN SNS Total	>65 years	30	19.34			1.000
	56-65 years	27		24.18		1.000
	45-55 years	23			33.90	1.000

Used harmonic mean sample size = 26.35

Economic status analysis with study variables: Analysis of variance (ANOVA) testing was used for analysis of economical status and CHIEF-LF; BI; LSNS of the post-stroke participants

are presented in the Tables 16.1, 16.2 and 17.1, 17.2 and 18.1, 18.2. Analysis of variance revealed that there is a significant variation ($p < 0.000$) (ci = 95%) in the CHIEF-LF total score among participants belonging to different economical status groups of high; middle; low income. Post-hoc Duncan tests revealed that participants in the low income group had a higher mean score (4.16) for perceiving environmental barrier compared to mean score of their counterparts of high (1.63) and middle (2.90) income groups. Also ANOVA between BI and economic status groups revealed that there is a significant variation ($p < 0.000$) (ci = 95%) in the BI among participants belonging to different economic status groups as above. Post-hoc Duncan tests revealed that participants in the high income group had a higher mean score (93.63) for high physically able compared to their counterparts of low (74.10) and middle (84.16) income groups. Similarly, ANOVA between LSNS and economic status groups revealed that there is a significant variation ($p < 0.000$) (ci = 95%) in the LSNS among participants belonging to different economic status groups as above. Post-hoc Duncan tests revealed that participant in the high income group had a higher mean score (36.00) for reduced isolation or more social participation compared to their counterparts low (19.42) and middle (25.96) income groups.

TABLE 16.1: ANOVA between Environmental Barriers and economical status of post-stroke participants

Scale	Groups	Sum of Squares	df	Mean Square	F	Sig.
CHIEF Total	Between Groups	79.51	2	39.76	63.08	0.000**
	Within Groups	48.52	77	0.63		
	Total	128.04	79			

TABLE 16.2: Post Hoc Duncan Test for Homogeneous Subsets of the above

Scale	ECONOMY	N	Subset for alpha = 0.05			Significant
			1	2	3	
CHIEF Total	High income	22	1.63			1.000
	Middle income	30		2.90		1.000
	Low income	28			4.16	1.000

Used harmonic mean sample size = 26.20

TABLE 17.1: ANOVA between physical ability and economical status of post-stroke participants

Scale	Groups	Sum of Squares	df	Mean Square	F	Sig.
BARTHEL Index Total	Between Groups	4739.06	2	2369.53	44.87	0.000**
	Within Groups	4065.93	77	52.80		
	Total	8805.00	79			

TABLE 17.2: Post Hoc Duncan Test for Homogeneous Subsets of the above

Scale	AGE	N	Subset for alpha = 0.05			Significant
			1	2	3	
BARTHEL Index Total	Low income	22	74.10			1.000
	Middle income	30		84.16		1.000
	High income	28			93.63	1.000

Used harmonic mean sample size = 26.20

TABLE 18.1: ANOVA between physical ability and economical status of post-stroke participants

Scale	Groups	Sum of Squares	df	Mean Square	F	Sig.
LUBBEN SNS Total	Between Groups	3393.86	2	1696.93	46.01	0.000**
	Within Groups	2839.82	77	36.88		
	Total	6233.68	79			

TABLE 18.2: Post Hoc Duncan Test for Homogeneous Subsets of the above

Scale	AGE	N	Subset for alpha = 0.05			Significant
			1	2	3	
LUBBEN SNS Total	Low income	22	19.42			1.000
	Middle income	30		25.96		1.000
	High income	28			36.00	1.000

Used harmonic mean sample size = 26.20

Physical ability and Environmental barrier: Analysis of mean difference between the CHIEF-LF total and BI outcome of the participants are tabulated in Table 19. The test of significance reveals that there is a significant difference ($p < 0.000$) (ci = 95%) for the CHIEF-LF total between low physically able (3.69 ±0.96) and high physically able (1.76 ±0.69) participants. Low physically able participants perceived significantly higher environmental barriers compared to high physically able participants.

TABLE 19: Mean difference between Environmental barrier and physical ability of post-stroke participants

Scale	BI Outcome	N	Mean ± Std. Deviation	t-test	Level of significant
CHIEF Total	Low Physically Able	51	3.69 ±0.96	9.45	0.000**
	High Physically Able	29	1.76 ±0.69		

Environmental barrier and social participation: Analysis of variance (ANOVA) testing was used for analysis of social participation outcome from LSNS and CHIEF-LF sub-scales and total scores of the post-stroke participants and presented in the table 20.1 & 20.2. Analysis of variance revealed that there is a significant variation ($p < 0.000$) (ci = 95%) in the physical / structural, assistance / services, attitude / support & policy barriers and CHIEF-LF total score among participants belonging to different social participation outcome groups of isolated; high risk for isolation; moderate risk for isolation and low risk for isolation. Post-hoc Duncan tests revealed that participants in the isolated group with a higher mean chief sub-scale scores (physical – 5.87; assistance – 4.64; attitude – 3.66 ; policy – 4.37); higher mean chief total score (4.64) and high risk for isolation group with a next higher mean chief sub-scale scores (physical – 4.30; assistance – 3.58; attitude – 2.50; policy – 2.72); next higher mean chief total score (3.28) for perceiving environmental barriers, compared to mean score of their other counterpart groups of moderate risk of isolation (subscale mean scores – 2.96, 2.24, 1.76, 2.02 and total mean score – 2.39) and low risk of isolation (subscale mean scores – 1.61, 1.34, 0.86, 1.17 and total mean score – 1.48) accordingly as above. Work barrier sub-scale was not computed because of data insufficiency between the comparative groups.

TABLE 20.1 ANOVA between environmental barrier and social participation of post-stroke participants

Scale	Groups	Sum of Squares	df	Mean Square	F	Sig.
Physical / Structural	Between Groups	218.824	3	72.941	432.109	0.000**
	Within Groups	12.829	76	.169		
	Total	231.653	79			
Assistance / Services	Between Groups	137.814	3	45.938	296.300	0.000**
	Within Groups	11.783	76	.155		
	Total	149.597	79			
Work	Between Groups	1.419	1	1.419	.521	0.479**
	Within Groups	51.709	19	2.722		
	Total	53.128	20			
Attitude / Support	Between Groups	92.804	3	30.935	129.238	0.000**
	Within Groups	18.192	76	.239		
	Total	110.996	79			
Policies	Between Groups	120.436	3	40.145	121.393	0.000**
	Within Groups	25.133	76	.331		
	Total	145.569	79			
CHIEF Total	Between Groups	118.180	3	39.393	303.413	0.000**
	Within Groups	9.867	76	.130		
	Total	128.047	79			

TABLE 20.2 Post-hoc Duncan test between environmental barriers and Social participation of post-stroke participants

Scale	LSNS Outcome	N	Subset for alpha = 0.05				Sig.
			1	2	3	4	
Physical / Structural	Low Risk for Isolation	23	1.615				1.000
	Moderate Risk for Isolation	13		2.968			1.000
	High Risk for Isolation	22			4.309		1.000
	Isolated	22				5.873	1.000
Assistance / Services	Low Risk for Isolation	23	1.342				1.000
	Moderate Risk for Isolation	13		2.249			1.000
	High Risk for Isolation	22			3.585		1.000
	Isolated	22				4.648	1.000
Work	Low Risk for Isolation	NC	NC				NC
	Moderate Risk for Isolation	NC		NC			NC
	High Risk for Isolation	NC			NC		NC
	Isolated	NC				NC	NC
Attitude / Support	Low Risk for Isolation	23	0.861				1.000
	Moderate Risk for Isolation	13		1.769			1.000
	High Risk for Isolation	22			2.509		1.000
	Isolated	22				3.664	1.000
Policies	Low Risk for Isolation	23	1.179				1.000
	Moderate Risk for Isolation	13		2.024			1.000
	High Risk for Isolation	22			2.723		1.000
	Isolated	22				4.376	1.000
CHIEF Total	Low Risk for Isolation	23	1.489				1.000
	Moderate Risk for Isolation	13		2.393			1.000
	High Risk for Isolation	22			3.280		1.000
	Isolated	22				4.640	1.000

Used harmonic mean sample size = 18.92.

Correlation Analysis: Correlation was done between the three major study variables: environmental barriers, physical ability & social participation and also with major demographic profile of age, economical status and post-stroke duration and tabulated in table 21.

1. A significant *negative* correlation exists between physical ability and environmental barriers of the post-stroke participants. Correlation of physical ability and environmental barriers reveals that as physical ability increases, the environmental barriers significantly decreases (-0.936) (ci = 95%).
2. A significant *negative* correlation exists between environmental barriers and social participation of the post-stroke participants. Correlation of environmental barriers and social participation reveals that as environmental barriers increases, the social participation significantly decreases (-0.947) (ci = 95%).
3. A significant *positive* correlation exists between physical ability & social participation post-stroke. Correlation of physical ability & social participation reveals that as physical ability increases, social participation significantly increases (+ 0.930) (ci = 95%).
4. A significant *positive* correlation exists between age of stroke participants and environmental barriers perceived. Correlation of age and environmental barriers reveals that as age of getting affected by stroke increases, the environmental barriers significantly increases (+ 0.671) (ci = 95%).
5. A significant *negative* correlation exists between economic status of post-stroke participants and environmental barriers perceived. Correlation of economic status and environmental barriers reveals that as economic status increases, the environmental barriers significantly decreases (- 0.788) (ci = 95%).
6. A significant *negative* correlation exists between post-stroke duration of participants and environmental barriers perceived. Correlation of post-stroke duration and environmental barriers reveals that as duration post-stroke increases, the environmental barriers significantly decreases (- 0.794) (ci = 95%).
7. A significant *negative* correlation exists between age of stroke participants and physical ability. Correlation of age and physical ability reveals that as age of getting affected by stroke increases, physical ability significantly decreases (- 0.644) (ci = 95%).

8. A significant *positive* correlation exists between economical status & physical ability post-stroke. Correlation of economic status & physical ability reveals that as economical status increases, physical ability significantly increases (+ 0.734) (ci = 95%).
9. A significant *positive* correlation exists between post-stroke duration of participants & physical ability. Correlation of post-stroke duration & physical ability reveals that as duration increases, physical ability significantly increases (+ 0.824) (ci = 95%).
10. A significant *negative* correlation exists between age of stroke participants & social participation. Correlation of age & social participation reveals that as age affected with stroke increases, social participation significantly decreases (- 0.677) (ci = 95%).
11. A significant *positive* correlation exists between economical status and social participation of post-stroke participants. Correlation of economical status and social participation reveals that as economical status increases, social participation significantly increases (+ 0.732) (ci = 95%).
12. A significant *positive* correlation exists between post-stroke duration & social participation. Correlation of post-stroke duration & social participation reveals that as duration post-stroke increases, participation significantly increases (+0.800) (ci = 95%).

TABLE 21: Correlation between Environmental Barriers, Physical Ability, Social participation & Demographic profile of the participants

Study Variables	CHIEF Total	Lubben SNS	Barthel Index	Age	Economy	Duration post-stroke
CHIEF Total	1	-0.947**	-0.936**	0671**	-0.788**	-0.794**
Lubben SNS	-0.947**	1	0.930**	-0.677**	0.732**	0.800**
Barthel Index	-0.936**	0.930**	1	-0.644**	0.734**	0.824**
Age	0.671**	-0.677**	-0.644**	1	-0.442**	-0.550**
Economy	-0.788**	0.732**	0.734**	-0.442**	1	0.726**
Duration post-stroke	-0.794**	0.800**	0.824**	-0.550**	0.726**	1

** Correlation is significant at the 0.01 level (2-tailed).

TABLE 22:

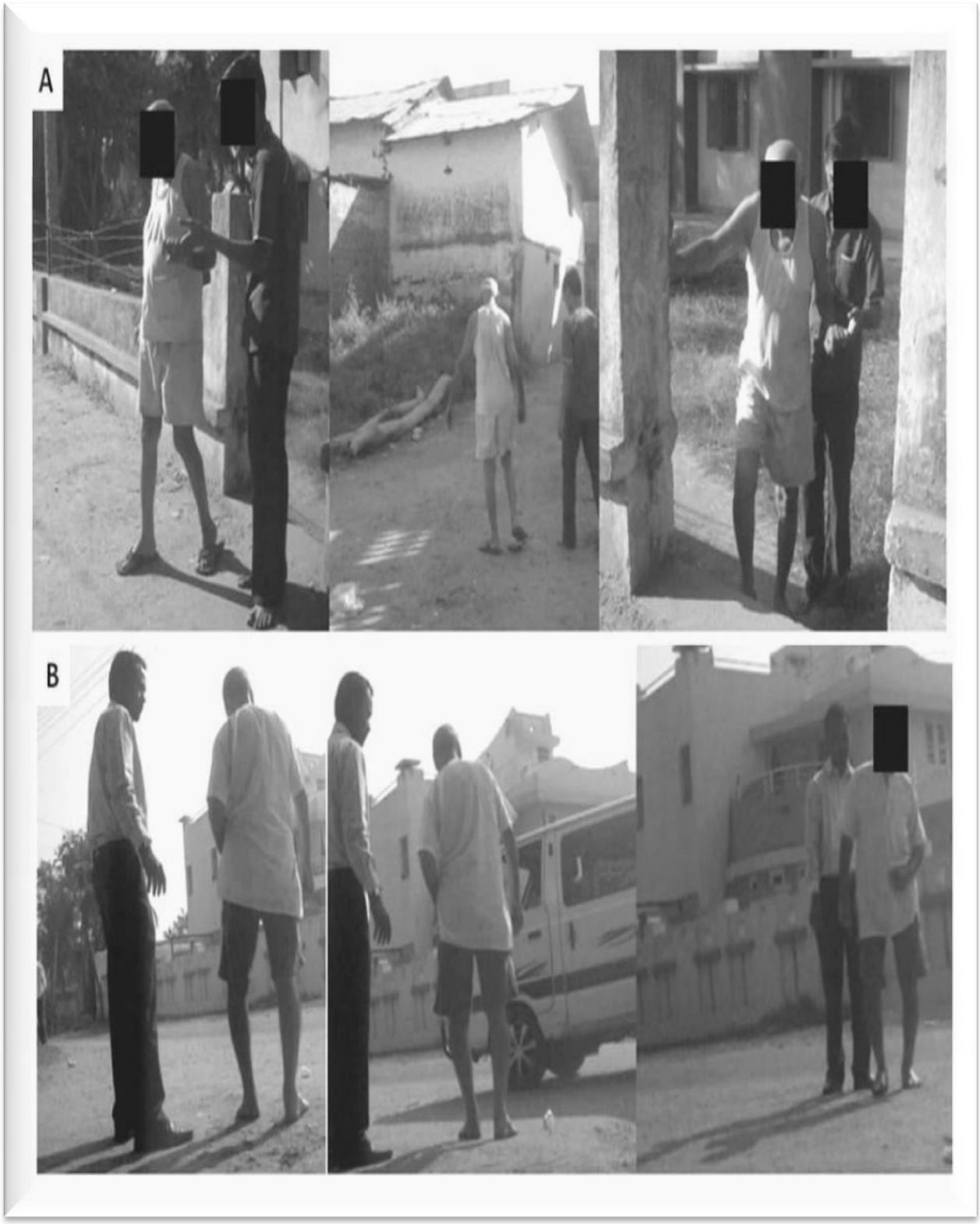
RELATIONSHIP OBTAINED BETWEEN THE STUDY VARIABLES

S.No.	Study Variables	Correlation
1	*Physical Ability Vs Environmental Barriers*	Negative
2	*Environmental barriers Vs Social participation*	Negative
3	*Physical ability Vs Social participation*	Positive
4	Age Vs Environmental barriers	Positive
5	Economic status Vs Environmental barriers	Negative
6	Post-stroke duration Vs Environmental barriers	Negative
7	Age Vs Physical ability	Negative
8	Economical status Vs Physical ability	Positive
9	Post-stroke duration Vs Physical ability	Positive
10	Age Vs Social Participation	Negative
11	Economic status Vs Participation	Positive
12	Post-stroke duration Vs Participation	Positive

Inferences: ** Indicating statistically significant levels; ^{NS} Indicating not significant levels for all of the Mean difference, ANOVA and Correlation tables mentioned above in the Results section.

WALKING IN THE REAL WORLD BY AFFECTED INDIVIDUALS

(Barriers in assistance, uneven terrain, newer places, building architecture)



7. DISCUSSION

The results of this study presented above exhibits an alarming increased impact of environmental barriers on the post-stroke hemiplegic patients. The impact of environmental barriers obtained found from CHIEF-LF, projects a high level of presence of environmental barriers among post-stroke participants. However, the obtained barriers for the post-stroke participants in this study was higher compared to CHIEF outcomes obtained from stroke group of previous studies (Ling Riong et al., 2012) (Chang wan et al., 2005) and also even higher than people with traumatic brain injury and spinal cord injury (Whiteneck CG et al., 2004) (Dijkers et al., 2004). Among the 5 domains, the physical and structural barrier is the most impact barrier perceived by post-stroke participants, which also supports the result from earlier study on stroke participants [23, 44]. The obtained value for physical and structural barrier was higher, which might be due to poor roads or side-walks with cracks or pot-holes and crowded places which are a common sight in our locality [30]. The design of majority of the public places (bus stop or railway station) and buildings (non availability of ramps or lifts or escalators) which is still not yet designed accessible to the impaired stroke individuals is also a notable factor. Also, barrier to technology usage (computers or mobile phones or remote controls for television / air-conditioner or ATM accessibility) was reported by more number of participants, which might be related to lack of devices that can be easily used by stroke individuals [28]. This also shows that there are more needs in technology usage but the stroke people are restricted, because of the barriers in using those technological resources. Modifications of these basic technological devices or properly laid roads and side-walks or accessible buildings can help in removing these physical/structural barriers to a considerable extent for post-stroke people.

The service & assistance barrier and policy barrier follows next as the most impact barrier perceived by post-stroke participants. This was also in line with previously obtained results which stated, about 24% of stroke group participants perceived transportation services, systems and policies as a barrier (Rochette et al., 2001). The values obtained from this study are higher, which can be reasoned out as lack of medical care availability to all age groups and also even the poor quality of medical care given to the post-stroke participants are notable factors. Also increasing population, heavy traffic and use of vehicles (bike travelling was feared and not preferred by most participants; inaccessible public & private vehicles like bus or auto) can act as

barrier for transportation. Help in the community was also a pathetic situation reported, where the post-stroke participants had to wait in queues for getting their requirements and even did not get seats while they were standing in public locations. Finding for policy barriers were also moderate and supports the outcomes of Quinn G, et al., 2002, which reported that government & public services, providing equal opportunity were identified as moderate environmental barriers. However, the finding for work barrier reported higher scores that varied from results of previous studies [40, 44, 45]. This might be because the difference in working & not-working group sizes in this study and also the additional finding that more stroke individuals don't work which might be due to the presence of more barriers related to their working environment.

Supporting the WHO's current conceptual model of disability, physical ability had a major effect on the impact of environmental barriers perceived by post-stroke participants [16, 40]. The participants who were low in their physical ability faced more environmental barriers and this in-turn had a major impact on their social participation, with post-stroke participants facing higher environmental barriers are isolated. Thus, physical ability is a significant predictor of perceiving environmental barriers. Also, 4 of the CHIEF-LF subscales (physical / structural, services / assistance, policy, attitude / support) and total scores were significant predictors of social participation [48, 56]. Furthermore, the relationship between physical ability – environmental barriers – social participation is also supported in this study with post-stroke participants either, who are less physically able, faces more environmental barriers and subsequently reduces their social participation or who are more physically able faces less environmental barriers and increases their social participation [50, 51].

The environmental barriers showed significant differences with various demographic profiles of post-stroke participants. Groups reported more substantial barriers were of elderly age (> 65 years), female, not working, rural dwelling, low income status, right side affected and those who are < 1 year of duration post-stroke. Also it has reported that participants who had higher physical ability and increased social participation were comparatively of younger age (45 – 55 years), male, working, urban dwelling, high income status, left side affected and those who are > 1 year of duration post-stroke. Elderly and female participants faced more barriers, which might be due to their general health status and difficulty in overcoming even minor environmental barriers [49, 52]. Comparatively, younger participants had positive factors like lesser co-

morbidities, better motivation and more needs to participate which might have helped them in overcoming the barriers [44, 48]. Rural dwelling participants usually have lack of facilities and infrastructures in most of their environment and this might have made them prone to face higher barriers. Also economic status is more important in encountering barriers because availability of adaptive devices or affording own transportation facilities or modifying home architecture or availing medical care will greatly reduce or increase the impact of facing environmental barriers accordingly [23, 34, 40]. Also not-working participants faced more of barriers which could be reasoned out as only a few of the participants in the study were working. Stroke characteristics of participants who are right side affected, which being their dominant side would have been a major factor for them in encountering more environmental barriers. Also, Stroke people who are > 1 year of post-stroke duration faced lower impact of environmental barriers which might be reasoned as, that the participants would have adapted to the environmental demands as they are encountering more and more barriers continuously in the environment [48, 55, 58].

The environmental barrier scores of this study reported high scores than previous other studies, which could be attributed to the participants' characteristics, local environmental and cultural variations. One of the major factor being higher percent of post-stroke participants were < 1 year of duration post-stroke and hence new barriers emerge as they come across new social dimensions as each day passes. Secondly, the mean age of participants was 59 years and so might have more needs to participate in the environment and subsequently could have faced more environmental barriers. Finally, the environmental differences is another major factor, which includes lack of proper maintenance of surroundings (roads or streets), inaccessible places, lack of quality medical care, transportation difficulties, disabled friendly technological accessories, crowded places, availing government policies or benefits, help from community and also cultural differences may have contributed to the higher impact of environmental barriers for post-stroke participants in our region.

8. STUDY LIMITATIONS

The limitations of this study are as follows:

1. "Work barrier" domain of CHIEF-LF was not computed in sub-group analysis, because of data insufficiency and this may account for findings of non-significant scores for work.
2. CHIEF-LF assesses only the participants' perceived environmental barriers and so the "actual" barriers perceived in real environment could have variations.
3. LSNS assesses only the risk of isolation and not specifically the areas of participation.
4. Demographic profile included only the major data which could have a role in determining the impact of environmental barriers.
5. "Environmental Facilitators" were not assessed, as the CHIEF-LF scale measures only the perceived Environmental Barriers.

FUTURE RESEARCH

1. Future research should focus on eliminating this study's limitations by relating the specific environmental barriers to specific participation dimensions than being in general.
2. Interventional research that focuses on modifying the environmental factors can be done to study their result on participation outcome and including other factors from the conceptual models of disability.

9. CONCLUSION

Several factors in the environment, in which we live, determine our level of activity and social participation. In the process of encountering into the environment, starting from taking a step outside from the house to the street, the disabled post-stroke hemiplegic individuals faces many barriers, which has been clearly inferred from this study. Alarmingly, the impact of environmental barriers experienced by our stroke group was on a higher range, which subsequently reduces their social participation and are more isolated as compared to stroke people in other countries around the world. However, several steps have been taken by our government for the disabled to overcome these environmental barriers (examples: low-floor buses, ramps, assistances & priorities, employment benefits, etc.). But are these steps completely availed to the stroke people and their needs are still debatable. This definitely needs to be noted from a Physiotherapist point of view, as we have to address this need of our stroke patients, which is to be an "active member" of the society. Thus, a holistic rehabilitation involving creating awareness about disability, accessible services and training our stroke participants to overcome or modify these environmental barriers is needed, which will help them to participate actively in the society and to an extent that satisfies their social needs. Further research is needed to establish the role of environmental barriers in various other aspects of the life of people disabled by stroke, so that most of their possible problems could be observed and rehabilitated holistically, for them to lead their life satisfactorily even with their residual disabilities.

REFERENCES:

1. WHO, *A safer future: global public health security in the 21st century*. Heart Disease and Stroke Statistics -2007 Update. A Report from the American Heart Association Statistics Committee & Stroke Statistics Subcommittee. American Heart Association, Inc., 2007.
2. American Stroke Association, *Primary Prevention of Ischemic Stroke: A Guideline From the American Heart Association / American Stroke Association Stroke Council*. Stroke; 37:1583-1633. 2009.
3. Bath P, Lees K. *ABC of arterial and venous disease.* Acute stroke BMJ; 320:920-923. 2000.
4. Pandian J, Srikanth V, Read S, Thrift A. *Poverty and stroke in India: a time to act*. Stroke; 38: 3063-9. 2007.
5. Feigin V, Lawes C, Bennet D, Barker_Cello S, Parag V. *Worldwide stroke incidence and early case fatality in 56 population based studies: a systematic review*. Lancet Neurology; 8 (4): 355-369. 2009.
6. Shah B, Mathur P. *Workshop Report on Stroke Surveillance in India. Division of Non-communicable Diseases,* Indian Council of Medical Research, New Delhi, 2006.
7. Ezzati M, Lopez A, Rodgers A et al., *Comparative quantification of health risks. Global and regional burden of disease attritutable to major risk factors.* Geneva: WHO, 2004.
8. Ghamija R, Mittal S, Bansal B. *Trends in Clinico-epidemiological correlates of stroke in the community.* J Indian Acad Clin Med; 5(1): 28-31. 2000.
9. Sethi P. *Stroke-incidence in India and management of ischaemic stroke*. Neurosciences; 4(3): 139-141. 2002.
10. Das S, Banerjee T. *Stroke Indian Scenario*. Circulation; 118: 2719-24. 2008.
11. Dalal P,Bhattacharjee M, Vairale J, Bhat P. *UN millennium development goals: can we halt the stroke epidemic in India?,* Ann Indian Acad Neurol; 10: 130-6. 2007.
12. Gupta R, Joshi P, Mohan V, Reddy S, Yusuf S. *Epidemiology and causation of coronary heart disease and stroke in India.* Heart; 94: 16-26. 2008.
13. Charlton J, *Nothing about us without us: disability, oppression and empowerment*. Berkeley, University of California Press, 1998.

14. Thomas C, *Female forms: experiencing and understanding disability*. Buckingham, Open University Press, 1999.
15. Shakespeare T. *Disability rights and wrongs*. London, Routledge, 2006.
16. The International Classification of Functioning. *Disability and Health*. Geneva, World Health Organization (WHO), 2001.
17. Leonardi M et al. MHADIE Consortium. *The definition of disability: what is in a name?* Lancet; 368:1219-1221. 2006.
18. World Health Organization, United Nations Educational, Scientific and Cultural Organization, International Labour Organization, International Disability and Development Consortium. *Community-based rehabilitation: CBR guidelines*. Geneva, World Health Organization, 2010.
19. Miller P, Parker S, Gillinson S. *Disablism: how to tackle the last prejudice*. London, Demos, 2004.
20. Silva AG et al., *Environmental factors: a systematic review of instruments and content analysis using the ICF*. 2010.
21. Harrison-Felix, C. The Craig Hospital Inventory of Environmental Factors. The centre for Outcome Measurement in Brain Injury (Internet). 2001.
22. Fougeyrollas P, Noreau L, Boschen K. *The perceived influence of the environment on social participation among individuals with spinal cord injury*. Top Spinal Cord Inj Rehabil.; 7(3):56–72. 2002.
23. Urimubenshi G, Rhoda A, *Environmental barriers experienced by stroke patients in Musanze district in Rwanda: a descriptive qualitative study*; African Health Sciences; 11(3): 398 – 406, 2011.
24. Swan J, *Stroke: environmental barriers,* British Journal of Healthcare Assistants; Vol. 02 No 11, 2008.
25. Beard JR, Blaney S, Cerda M, et al. *Neighborhood characteristics and disability in older adults*. J Gerontol B Psychol Sci Soc Sci. 64(2):252–257. 2009.
26. Clarke P, George LK. *The role of the built environment in the disablement process*. Am J Public Health. 95(11):1933–1939. 2005.
27. Verbrugge LM, Jette AM. *The disablement process*. Soc Sci Med.; 38:1–14. 1994.

28. Hammel J, *Examining Environmental Barriers & Supports to Home & Community Participation with People with I/DD*, 2010.
29. Vincent C, Deaudelin I, Robichaud et al., *Rehabilitation needs for older adults with stroke living at home: perceptions of four populations* BMC Geriatr **7**: 20. 2007.
30. Clarke P and Black S, Quality-of-life following stroke: Negotiating disability, identity and resources. *J App Gerontol* 24(4): P319–6. 2005.
31. Keysor J, Jette A, Haley S. *Development of the home and community environment (HACE) instrument*. J Rehabil Med. 37(1):37–44. 2005.
32. Levasseur M, Desrosiers J and Noreau L, *Is social participation associated with quality-of-life of older adults with physical disabilities?* Disabil Rehabil 26(20):1206–13. 2004.
33. Keysor JJ, Jette AM, Coster W, Bettger JP, Haley SM. *Association of environmental factors with levels of home and community participation in an adult rehabilitation cohort.* Arch Phys Med Rehabil. 87(12):1566–1575. 2006.
34. Reid D, *Impact of the environment on role performance in older stroke survivors living at home.* International Journal of Therapy and Rehabilitation 11(12): 567–73. 2004.
35. Woollacott M, and Shumway-Cook A, Attention and the control of posture and gait: a review of an emerging area of research. *Gait and Posture* 16: 1 - 14.; 2002.
36. Shumway-Cook A, Patla A, Stewart A, Ferrucci L, Ciol MA, Guralnik JM. *Environmental components of mobility disability in community-living older persons*. J Am Geriatr Soc. 51(3):393–398. 2003.
37. Patla A, and Shumway-Cook A. *Dimensions of mobility: defining the complexity and difficulty associated with community mobility. Journal of Aging and Physical Activity;* 7: 7 – 19; 1999.
38. Duncan PW. *Stroke disability.* Pbys Thm*; 74:399407.* 1994.
39. Rowles G, *Handbook of Clinical Gerontology*. Pergamon Prews, New York. 1987.
40. Freedman VA, Grafova IB, Schoeni RF, Rogowski J. *Neighborhoods and disability in later life.* Soc Sci Med. 66(11):2253–2267. 2008.
41. Rom J. M. Perenboom and Astrid M. J. Chorus. *Measuring participation according to the International Classification of Functioning, Disability and Health (ICF)*. Disability and rehabilitation, vol. 25, no. 11–12, 577–587. 2003.

42. Viosca E, Martínez JL, Almagro PL, Gracia A, González C. *Proposal and validation of a new functional ambulation classification scale for clinical use*. Arch Phys Med Rehabil. 86:1234-8. 2005.
43. Lubben JE. *Assessing social networks among elderly populations*. Family and Community Health, 11 (3): 42 – 52. 1988.
44. Lin-Rong Liao et al*., Measuring environmental barriers faced by individuals living with stroke: development and validation of the Chinese version of the Craig Hospital Inventory of Environmental Factors*. J Rehabil Med 2012.
45. Chang Wan Han et al., *Valididty and utility of the CHIEF for Korean community-dwelling elderly with or without stroke*. Tohoku J. Exp. Med, 206, 41-49., 2005.
46. Whiteneck GG, Gerhart KA, Cusick CP. *Identifying environmental factors that influence the outcomes of people with traumatic brain injury*. J Head Trauma Rehabil. 19(3):191–204. 2004.
47. Whiteneck G, Meade MA, Dijkers M, Tate DG, Bushnik T, Forchheimer MB. *Environmental factors and their role in participation and life satisfaction after spinal cord injury*. Arch Phys Med Rehabil. 85(11):1793–1803. 2004.
48. Mollenkopf H, Marcellini F, Ruoppila I, Flaschentrager P, Gagliardi C, Spazzafumo L. *Outdoor mobility and social relationships of elderly people*. Arch Gerontol Geriatr. 24(3):295–310. 1997.
49. Hilton EL, *The meaning of stroke in elderly women; the live experience: a phenomenological investigation*. J Gerontol Nurs 28(7): 19–26. 2002.
50. Hartman-Maeir A, Soroker N, Ring H, Avnti N and Katz N, *Activities, participation and satisfaction on year post stroke.* Disability and rehabilitation 29(7): 559–66. 2007.
51. Gray D, Gould M, Bickenback JE, *Environmental barriers and disability*. J Archit Plann Res. 20(1):29–37. 2003.
52. Balfour JL. *Neighborhood environment and loss of physical function in older adults: evidence from the Alameda County Study*. Am J Epidemiol. 155 (6):507–515. 2002.
53. Sansoni J, Marosszeky N, Sansoni E, Fleming G, *Final Report: Effective Assessment of Social Isolation.* Centre for Health Service Development, University of Wollongong. 2010.

54. Maarten Uyttenboogaart MD et al., *Optimizing Cutoff Scores for the Barthel Index and the Modified Rankin Scale for Defining Outcome in Acute Stroke Trials.* Stroke.36:1984-1987. 2005.
55. Nina et al., *Social integration and its value within the multiple setting in stroke care*: International Journal of Integrated Care, September - ISSN 1568-4156. 2012.
56. Whiteneck GG et al., *Quantifying environmental factors: a measure of physical, attitudinal, service, productivity, and policy barriers*. Arch Phys Med Rehabil. Aug; 85(8):1324-35. 2004.
57. Rochette A, Desrosiers J, Noreau L. *Association between personal and environmental factors and the occurrence of handicap situations following a stroke*. Disabil Rehabil, 23: 559–569. 2001.
58. Algurén B, Lundgren-Nilsson A, Sunnerhagen KS. *Facilitators and barriers of stroke survivors in the early post-stroke phase.* Disabil Rehabil, 31: 1584–1591. 2009.
59. Quinn G, Degener T. A survey of international, comparative and regional disability law reform. In: Breslin ML, Yee S, eds. *Disability rights law and policy - international and national perspectives*. Ardsley, Transnational, 2002.
60. Mahoney FI, Barthel D. *Functional evaluation: the Barthel Index.* , Maryland State Medical Journal; 14:56-61. Used with permission. 1965.
61. Sangha H et al., *A comparison of the Barthel Index and the Functional Independence Measure as outcome measures in stroke rehabilitation: patterns of disability scale usage in clinical trials*. Int J Rehabil Res.; 28(2):135-9. 2005.
62. SC, Anderson BA. *Predictors of stroke outcome using objective measurement scales.* Stroke; 21:78-81. 1990.
63. Gray D, Gould M, Bickenbach J. *Environmental barriers and disability*. J Architect Plann Res; 20:29-37. 2003.
64. Louise Ada and Catherine M Dean, *Improving community ambulation after stroke: the AMBULATE trial*; BMC Neurology, 2009.

APPENDIX 1

CONSENT FORM

I Mr. / Mrs. / Ms. ……... is informed by the evaluator about the study on "The Impact of Environmental Barriers and their relation to Physical Ability and Social Participation of Post-Stroke Hemiplegic individuals". After getting a clear picture of the study and its importance, I consciously give my consent to be a part of the participants in contributing relevant information to the questions asked. I declare that the information given by me is true to the best of my knowledge. I was also informed about my right to withdraw from the study, if and whenever I desire.

Signature of the Evaluator

Date:

Signature of the participant

Date:

CODE: RATER: DATE:

DATA COLLECTION FORM – PHYSICAL DISABILITY / ENVIRONMENTAL BARRIERS / PARTICIPATION

SECTION: 1 DEMOGRAPHIC DATA:

NAME :

AGE :

GENDER : ☐ Male ☐ Female

PLACE : ☐ Rural ☐ Urban ☐ Suburban

LIVING WITH : ☐ Spouse ☐ Family ☐ Alone

OCCUPATION : **STATUS:** ☐ Working ☐ Not Working

ECONOMIC STATUS : ☐ Low ☐ Middle ☐ High

WALKING AIDS : ☐ YES ☐ NO

STROKE DURATION :

SIDE OF PARESIS :

AMS LEVEL :

FAC LEVEL :

SECTION: 2 BARTHEL INDEX:

ITEM	FEED	BATH	GROOM	DRESS	BLADDER	BOWEL	TOILET	TRANSFER	MOB	STAIR
SCORES										

BI TOTAL =

SECTION: 3 CRAIG HOSPITAL INVENTORY OF ENVIRONMENTAL FACTORS – LF:

ITEM	TRA	NAT	SURR	INFO	CARE	HLPH	HLPW	ATTH	ATTW	DISC	POLB	POLG
SCORES												
TECH	**EDU**	**EMP**	**DEV**	**DESH**	**DESW**	**COMM**	**HLPC**	**ATTC**	**PRO**	**SEH**	**SEW**	**SEC**

SECTION: 4 LUBBEN SOCIAL NETWORK SCALE:

ITEM	FAM1	FAM2	FAM3	FRI1	FRI2	FRI3	CR1	CR2	HELP	LIVING
SCORE										

LSNS TOTAL =

ANNEXURE 3

Craig Hospital Inventory of Environmental Factors

Being an active, productive member of society includes participating in such things as working, going to school, taking care of your home, and being involved with family and friends in social, recreational and civic activities in the community. Many factors can help or improve a person's participation in these activities while other factors can act as barriers and limit participation.

First of all, do you think **you** have had the same opportunities as other people to participate in and take advantage of:

education	____yes	____no
employment	____yes	____no
recreation/leisure	____yes	____no

First, please tell me how often each of the following has been a barrier to your own participation in the activities that matter to you. Think about the past year, and tell me whether each item on the list below has been a problem **daily, weekly, monthly, less than monthly, or never.** If the item occurs, then answer the question as to how big a problem the item is with regard to your participation in the activities that matter to you.

(Note: if a question asks specifically about **school or work** and you neither work nor attend school, check not applicable)

	Daily	Weekly	Monthly	Less than monthly	Never	Not applicable	Big problem	Little problem
1. In the past 12 months, how often has the availability of transportation been a problem for you?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
2. In the past 12 months, how often has the design and layout of your home made it difficult to do what you want or need to do?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
3. In the past 12 months, how often has the design and layout of buildings and places you use at school or work made it difficult to do what you want or need to do?	{	{	{	{	{	{		
When this problem occurs has it been a big problem or a little problem?							{	{
4. In the past 12 months, how often has the design and layout of buildings and places you use in your community made it difficult to do what you want or need to do?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
5. In the past 12 months, how often has the natural environment – temperature, terrain, climate – made it difficult to do what you want or need to do?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
6. In the past 12 months, how often have other aspects of your surroundings – lighting, noise, crowds, etc – made it difficult to do what you want or need to do?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{

	Daily	Weekly	Monthly	Less than monthly	Never	Not applicable	Big problem	Little problem
7. In the past 12 months, how often has the information you wanted or needed not been available in a format you can use or understand?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
8. In the past 12 months, how often has the availability of the education and training you needed been a problem for you?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
9. In the past 12 months, how often has the availability of health care services and medical care been a problem for you?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
10. In the past 12 months, how often has the lack of personal equipment or special adapted devices been a problem for you. Examples might include hearing aids, eyeglasses or wheelchairs.	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
11. In the past 12 months, how often has the lack of computer technology been a problem for you?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
12. In the past 12 months, how often did you need someone else's help in your home and could not get it easily?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
13. In the past 12 months, how often did you need someone else's help at school or work and could not get it easily?	{	{	{	{	{	{		
When this problem occurs has it been a big problem or a little problem?							{	{
14. In the past 12 months, how often did you need someone else's help in your community and could not get it easily?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
15. In the past 12 months, how often have other people's attitudes toward you been a problem at home?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
16. In the past 12 months, how often have other people's attitudes toward you been a problem at school or work?	{	{	{	{	{	{		
When this problem occurs has it been a big problem or a little problem?							{	{
17. In the past 12 months, how often have other people's attitudes toward you been a problem in the community?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{

	Daily	Weekly	Monthly	Less than monthly	Never	Not applicable	Big problem	Little problem
18. In the past 12 months, how often has a lack of support and encouragement from others in your home been a problem?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
19. In the past 12 months, how often has a lack of support and encouragement from others at school or work been a problem?	{	{	{	{	{	{		
When this problem occurs has it been a big problem or a little problem?							{	{
20. In the past 12 months, how often has a lack of support and encouragement from others in your community been a problem?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
21. In the past 12 months, how often did you experience prejudice or discrimination?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
22. In the past 12 months, how often has the lack of programs and services in the community been a problem?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
23. In the past 12 months, how often did the policies and rules of businesses and organizations make problems for you?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{
24. In the past 12 months, how often did education and employment programs and policies make it difficult to do what you want or need to do?	{	{	{	{	{	{		
When this problem occurs has it been a big problem or a little problem?							{	{
25. In the past 12 months, how often did government programs and policies make it difficult to do what you want or need to do?	{	{	{	{	{			
When this problem occurs has it been a big problem or a little problem?							{	{

ANNEXURE 4

THE LUBBEN SOCIAL NETWORK SCALE

The Lubben Social Network Scale can be used to assess the level of social support.

Measures: 10 questions from 5 Domains

(1) Family networks: 3 questions

(2) Friends networks: 3 questions

(3) Confidant relationships: 2 questions

(4) Helping others: 1 two part question

(5) Living arrangements: 1 question

Question	Response	Points
(1) How many relatives do you see or hear from at least once a month?	0	0
	1	1
	2	2
	3 pr 4	3
	5 to 8	4
	>= 9	5
(2) Tell me about the relative with whom you have the most contact: How often do you see or hear from that person?	less than monthly	0
	monthly	1
	a few times a month	2
	weekly	3
	a few times a week	4
	daily	5
(3) How many relatives do you feel close to? That is how many of them do you feel at ease with can talk about private matters or can call for help?	0	0
	1	1
	2	2
	3 or 4	3
	5 to 8	4
	>= 9	5
(4) Do you have any close friends? That is do you have any friends with whom you feel at ease can talk to about private matters or can call on for help? If so how many?	0	0
	1	1

	2	2
	3 or 4	3
	5 to 8	4
	>= 9	5
(5) How many of these friends do you see or hear from at least once a month?	0	0
	1	1
	2	2
	3 or 4	3
	5 to 8	4
	>= 9	5
(6) Tell me about the friend with whom you have the most contact. How often do you see or hear from that person?	less than monthly	0
	monthly	1
	a few times a month	2
	weekly	3
	a few times a week	4
	daily	5
(7) When you have an important decision to make do you have someone you can talk to about it?	never	0
	seldom	1
	sometimes	2
	often	3
	very often	4
	always	5
(8) When other people you know have an important decision to make do they talk to you about it?	never	0
	seldom	1
	sometimes	2
	often	3
	very often	4
	always	5
(9a) Does anybody rely on you to something for them each day?	yes	5
	no (if so go to 9b)	
(9b) Do you help anybody with something each day?	very often	4
	often	3

	sometimes	2
	seldom	1
	never	0
(10) Do you live alone or with other people?	live with spouse	5
	live with other relatives or friends	4
	live with other unrelated individuals (paid help etc.)	1
	live alone	0

where:

• In-laws are considered as relatives.

• Examples of helping others: shopping cooking dinner doing repairs cleaning house providing child care etc.?

• For item 9 I interpret the first part as referring to one person while the second part might apply to more than one person.

Total score = SUM (points for all 10 questions)

Interpretation:

• Minimum score: 0

• Maximum score: 50

• The higher the score the greater the level of social support.

• A score < 20 indicates a person who may have an extremely limited social network.

Score	Interpretation
< 20	Isolated
21 – 25	High risk for Isolation
26 – 30	Moderate risk for Isolation
>= 31	Low risk for Isolation

Reproduced from Lubben JE, Family & Community Health 1988;11:42-52.

ANNEXURE 5

BARTHEL INDEX SCORING FORM

Patient Name: _____ Rater Name: _____ Date: _____

FEEDING
0 = unable
5 = needs help cutting, spreading butter, etc., or requires modified diet
10 = independent

BATHING
0 = dependent
5 = independent (or in shower)

GROOMING
0 = needs to help with personal care
5 = independent face/hair/teeth/shaving (implements provided)

DRESSING
0 = dependent
5 = needs help but can do about half unaided
10 = independent (including buttons, zips, laces, etc.)

BOWELS
0 = incontinent (or needs to be given enemas)
5 = occasional accident
10 = continent

BLADDER
0 = incontinent, or catheterized and unable to manage alone
5 = occasional accident
10 = continent

TOILET USE
0 = dependent
5 = needs some help, but can do something alone
10 = independent (on and off, dressing, wiping)

TRANSFERS (BED TO CHAIR AND BACK)
0 = unable, no sitting balance
5 = major help (one or two people, physical), can sit
10 = minor help (verbal or physical)
15 = independent

MOBILITY (ON LEVEL SURFACES)
0 = immobile or < 50 yards
5 = wheelchair independent, including corners, > 50 yards
10 = walks with help of one person (verbal or physical) > 50 yards
15 = independent (but may use any aid; for example, stick) > 50 yards

STAIRS
0 = unable
5 = needs help (verbal, physical, carrying aid)
10 = independent

TOTAL SCORE= _____

The Barthel ADL Index: Guidelines
1. The index should be used as a record of what a patient does, not as a record of what a patient could do.
2. The main aim is to establish degree of independence from any help, physical or verbal, however minor and for whatever reason.
3. The need for supervision renders the patient not independent.
4. A patient's performance should be established using the best available evidence. Asking the patient, friends/relatives and nurses are the usual sources, but direct observation and common sense are also important. However direct testing is not needed.
5. Usually the patient's performance over the preceding 24-48 hours is important, but occasionally longer periods will be relevant.
6. Middle categories imply that the patient supplies over 50 per cent of the effort.
7. Use of aids to be independent is allowed.

References:
Mahoney FI, Barthel D. "Functional evaluation: the Barthel Index." *Maryland State Medical Journal* 1965;14:56-61.

Loewen SC, Anderson BA. "Predictors of stroke outcome using objective measurement scales." Stroke. 1990;21:78-81.

Gresham GE, Phillips TF, Labi ML. "ADL status in stroke: relative merits of three standard indexes."

Date created: 1/2000 Last reviewed: 8/2004
Reviewed/Approved by: L. Schwamm, M.D. / Acute Stroke Team

MASTER CHART

SI. No.	PS FREQ	PS MAG	PS IMP	SA FREQ	SA MAG	SA IMP	WS FREQ	WS MAG	WS IMP	AS FREQ	AS MAG	AS IMP	PO FREQ	PO MAG	PO IMP	CHIEF TOTAL	LSNS TOTAL	BI TOTAL
1	2.40	1.20	3.60	1.85	1.28	2.71	N	N	N	1.40	1.20	2.40	1.33	1.33	2.66	2.84	27	85
2	2.60	1.40	3.80	1.57	1.57	3.00	N	N	N	1.20	1.40	2.20	1.00	1.33	2.00	2.75	28	95
3	3.00	1.60	5.00	2.28	1.71	3.85	N	N	N	1.60	2.00	3.20	2.00	2.00	4.00	4.01	16	75
4	2.80	1.40	4.20	2.14	1.71	3.85	N	N	N	1.80	1.20	2.80	1.66	1.66	3.00	3.46	23	85
5	2.40	1.60	4.20	2.14	1.71	3.71	N	N	N	1.80	1.60	2.80	1.66	1.66	2.33	3.26	22	80
6	3.20	1.80	6.00	2.57	1.71	4.42	N	N	N	1.80	1.60	3.60	2.00	2.00	4.66	4.67	18	75
7	2.20	1.20	3.40	1.57	1.42	2.71	N	N	N	1.40	1.20	2.80	1.33	1.33	1.33	2.56	26	85
8	1.80	1.00	1.80	1.00	1.14	1.71	N	N	N	0.40	0.40	0.80	1.00	1.00	1.66	1.49	36	95
9	1.60	1.00	1.60	1.00	1.14	1.57	N	N	N	0.80	0.60	0.80	0.66	0.66	0.66	1.15	38	100
10	2.20	1.20	2.80	1.28	1.14	2.00	N	N	N	0.80	0.80	1.60	1.00	1.00	1.66	2.02	26	85
11	3.40	1.80	6.20	2.85	1.71	4.85	N	N	N	2.40	1.80	4.40	2.66	2.00	5.33	5.12	15	70
12	2.80	1.40	4.20	2.14	1.57	3.71	N	N	N	1.80	1.60	2.40	1.33	1.33	2.66	3.24	21	80
13	1.40	1.20	2.40	1.00	1.00	1.85	N	N	N	1.40	1.00	1.80	1.00	1.66	1.66	1.92	35	95
14	3.80	1.80	6.00	2.57	1.71	4.58	N	N	N	2.20	1.40	3.00	2.33	2.00	4.66	4.56	17	75
15	2.60	1.40	4.20	2.00	1.85	3.85	N	N	N	1.60	1.60	2.80	1.00	1.33	2.00	3.21	22	80
16	1.40	1.00	1.80	1.00	1.00	1.42	N	N	N	0.40	0.80	0.80	0.66	0.66	0.66	1.17	37	95
17	3.20	1.40	4.80	2.28	1.57	3.42	N	N	N	1.00	1.60	2.00	2.66	1.33	3.33	3.38	24	75
18	2.60	1.40	3.80	1.71	1.57	3.28	N	N	N	1.60	2.00	2.80	1.66	1.66	2.66	3.14	23	80
19	2.40	1.40	3.60	1.57	1.42	2.57	N	N	N	0.80	1.20	1.60	1.00	1.33	2.00	2.44	28	95
20	3.20	1.60	5.40	2.42	1.71	4.14	N	N	N	1.80	1.80	3.20	2.00	2.00	4.00	4.18	19	70
21	2.00	1.00	2.00	1.00	1.00	1.57	N	N	N	1.40	1.00	1.80	1.00	1.00	1.66	1.75	35	100
22	3.60	1.80	6.60	3.00	1.85	5.71	N	N	N	2.40	1.80	4.40	2.33	1.66	4.00	5.18	14	65
23	1.20	1.20	2.00	1.14	1.14	1.85	N	N	N	1.20	0.60	1.80	1.00	0.66	2.00	1.91	40	95
24	3.00	1.60	5.20	2.42	1.85	4.71	N	N	N	2.40	1.80	4.40	2.33	1.66	1.66	4.32	18	75
25	3.20	1.80	6.00	2.71	1.85	5	N	N	N	2.70	2.00	4.40	2.66	2.00	5.33	5.18	16	70
26	1.33	1.00	1.66	1.00	0.85	1.42	2.33	2.00	4.66	0.40	0.40	0.40	0.50	0.75	0.75	1.78	40	95
27	1.83	1.50	2.83	1.42	1.14	2.42	2.66	2.00	5.33	1.00	1.20	1.40	1.50	1.50	2.50	2.90	28	85
28	1.16	1.33	1.50	1.00	1.00	1.42	2.66	1.66	4.33	1.00	0.80	1.20	0.75	1.00	1.50	1.99	33	95

MASTER CHART

SI. No.	PS FREQ	PS MAG	PS IMP	SA FREQ	SA MAG	SA IMP	WS FREQ	WS MAG	WS IMP	AS FREQ	AS MAG	AS IMP	PO FREQ	PO MAG	PO IMP	CHIEF TOTAL	LSNS TOTAL	BI TOTAL
29	0.83	0.83	1.50	0.85	0.85	1.14	1.00	1.00	1.00	0.80	0.40	0.80	1.00	1.50	2.00	1.28	38	100
30	1.00	1.00	1.16	0.71	0.57	0.71	1.00	1.00	1.00	0.40	0.40	0.40	0.75	0.75	0.75	0.80	45	100
31	1.66	1.00	1.66	1.00	1.14	1.57	1.33	2.00	2.66	0.80	0.80	0.80	0.75	1.00	1.50	1.68	42	95
32	1.50	1.50	2.33	1.28	1.14	1.71	1.33	1.33	2.66	0.80	1.20	1.60	1.50	1.25	2.00	2.06	30	85
33	2.40	1.60	4.20	2.14	1.71	3.71	N	N	N	1.80	1.60	2.80	1.66	1.66	2.33	3.26	22	80
34	2.80	1.40	4.20	2.14	1.57	3.71	N	N	N	1.80	1.60	2.40	1.33	1.33	2.66	3.24	21	80
35	3.60	1.80	6.60	3.00	1.85	5.71	N	N	N	2.40	1.80	4.40	2.33	1.66	4.00	5.18	14	65
36	3.20	1.60	5.40	2.42	1.71	4.14	N	N	N	1.80	1.80	3.20	2.00	2.00	4.00	4.18	19	70
37	3.20	1.40	4.80	2.28	1.57	3.42	N	N	N	1.00	1.60	2.00	2.66	1.33	3.33	3.38	24	75
38	1.33	1.00	1.66	1.00	0.85	1.42	2.33	2.00	4.66	0.40	0.40	0.40	0.50	0.75	0.75	1.78	40	95
39	2.40	1.60	4.20	2.14	1.71	3.71	N	N	N	1.80	1.60	2.80	1.66	1.66	2.33	3.26	22	80
40	1.00	1.00	1.16	0.71	0.57	0.71	1.00	1.00	1.00	0.40	0.40	0.40	0.75	0.75	0.75	0.80	45	100
41	3.40	1.80	6.20	2.85	1.71	4.85	N	N	N	2.40	1.80	4.40	2.66	2.00	5.33	5.12	15	70
42	3.80	1.80	6.00	2.57	1.71	4.58	N	N	N	2.20	1.40	3.00	2.33	2.00	4.66	4.56	17	75
43	1.50	1.50	2.33	1.28	1.14	1.71	1.33	1.33	2.66	0.80	1.20	1.60	1.50	1.25	2.00	2.06	30	85
44	2.80	1.40	4.20	2.14	1.57	3.71	N	N	N	1.80	1.60	2.40	1.33	1.33	2.66	3.24	21	80
45	2.40	1.60	4.20	2.14	1.71	3.71	N	N	N	1.80	1.60	2.80	1.66	1.66	2.33	3.26	22	80
46	2.20	1.20	2.80	1.28	1.14	2	N	N	N	0.80	0.80	1.60	1.00	1.00	1.66	2.02	26	85
47	3.20	1.40	4.80	2.28	1.57	3.42	N	N	N	1.00	1.60	2.00	2.66	1.33	3.33	3.38	24	75
48	1.16	1.33	1.50	1.00	1.00	1.42	2.66	1.66	4.33	1.00	0.80	1.20	0.75	1.00	1.50	1.99	33	95
49	3.60	1.80	6.60	3.00	1.85	5.71	N	N	N	2.40	1.80	4.40	2.33	1.66	4.00	5.18	14	65
50	1.00	1.00	1.16	0.71	0.57	0.71	1.00	1.00	1.00	0.40	0.40	0.40	0.75	0.75	0.75	0.80	45	100
51	2.40	1.60	4.20	2.14	1.71	3.71	N	N	N	1.80	1.60	2.80	1.66	1.66	2.33	3.26	22	80
52	3.40	1.80	6.20	2.85	1.71	4.85	N	N	N	2.40	1.80	4.40	2.66	2.00	5.33	5.12	15	70
53	1.50	1.50	2.33	1.28	1.14	1.71	1.33	1.33	2.66	0.80	1.20	1.60	1.50	1.25	2.00	2.06	30	85
54	3.80	1.80	6.00	2.57	1.71	4.58	N	N	N	2.20	1.40	3.00	2.33	2.00	4.66	4.56	17	75
55	1.33	1.00	1.66	1.00	0.85	1.42	2.33	2.00	4.66	0.40	0.40	0.40	0.50	0.75	0.75	1.78	40	95
56	3.20	1.60	5.40	2.42	1.71	4.14	N	N	N	1.80	1.80	3.20	2.00	2.00	4.00	4.18	19	70

MASTER CHART

SI. No.	PS FREQ	PS MAG	PS IMP	SA FREQ	SA MAG	SA IMP	WS FREQ	WS MAG	WS IMP	AS FREQ	AS MAG	AS IMP	PO FREQ	PO MAG	PO IMP	CHIEF TOTAL	LSNS TOTAL	BI TOTAL
57	3.20	1.40	4.80	2.28	1.57	3.42	N	N	N	1.00	1.60	2.00	2.66	1.33	3.33	3.38	24	75
58	1.16	1.33	1.50	1.00	1.00	1.42	2.66	1.66	4.33	1.00	0.80	1.20	0.75	1.00	1.50	1.99	33	95
59	1.83	1.50	2.83	1.42	1.14	2.42	2.66	2.00	5.33	1.00	1.20	1.40	1.50	1.50	2.50	2.90	28	85
60	3.20	1.60	5.40	2.42	1.71	4.14	N	N	N	1.80	1.80	3.20	2.00	2.00	4.00	4.18	19	70
61	2.40	1.40	3.60	1.57	1.42	2.57	N	N	N	0.80	1.20	1.60	1.00	1.33	2.00	2.44	28	95
62	1.40	1.00	1.80	1.00	1.00	1.42	N	N	N	0.40	0.80	0.80	0.66	0.66	0.66	1.17	37	95
63	3.80	1.80	6.00	2.57	1.71	4.58	N	N	N	2.20	1.40	3.00	2.33	2.00	4.66	4.56	17	75
64	1.00	1.00	1.16	0.71	0.57	0.71	1.00	1.00	1.00	0.40	0.40	0.40	0.75	0.75	0.75	0.80	45	100
65	2.40	1.60	4.20	2.14	1.71	3.71	N	N	N	1.80	1.60	2.80	1.66	1.66	2.33	3.26	22	80
66	3.40	1.80	6.20	2.85	1.71	4.85	N	N	N	2.40	1.80	4.40	2.66	2.00	5.33	5.12	15	70
67	3.20	1.40	4.80	2.28	1.57	3.42	N	N	N	1.00	1.60	2.00	2.66	1.33	3.33	3.38	24	75
68	1.16	1.33	1.50	1.00	1.00	1.42	2.66	1.66	4.33	1.00	0.80	1.20	0.75	1.00	1.50	1.99	33	95
69	0.83	0.83	1.50	0.85	0.85	1.14	1.00	1.00	1.00	0.80	0.40	0.80	1.00	1.50	2.00	1.28	38	100
70	3.20	1.60	5.40	2.42	1.71	4.14	N	N	N	1.80	1.80	3.20	2.00	2.00	4.00	4.18	19	70
71	2.60	1.40	3.80	1.71	1.57	3.28	N	N	N	1.60	2.00	2.80	1.66	1.66	2.66	3.14	23	80
72	1.40	1.00	1.80	1.00	1.00	1.42	N	N	N	0.40	0.80	0.80	0.66	0.66	0.66	1.17	37	95
73	3.80	1.80	6.00	2.57	1.71	4.58	N	N	N	2.20	1.40	3.00	2.33	2.00	4.66	4.56	17	75
74	1.33	1.00	1.66	1.00	0.85	1.42	2.33	2.00	4.66	0.40	0.40	0.40	0.50	0.75	0.75	1.78	40	95
75	2.40	1.60	4.20	2.14	1.71	3.71	N	N	N	1.80	1.60	2.80	1.66	1.66	2.33	3.26	22	80
76	3.20	1.40	4.80	2.28	1.57	3.42	N	N	N	1.00	1.60	2.00	2.66	1.33	3.33	3.38	24	75
77	1.50	1.50	2.33	1.28	1.14	1.71	1.33	1.33	2.66	0.80	1.20	1.60	1.50	1.25	2.00	2.06	30	85
78	3.20	1.60	5.40	2.42	1.71	4.14	N	N	N	1.80	1.80	3.20	2.00	2.00	4.00	4.18	19	70
79	2.60	1.40	3.80	1.71	1.57	3.28	N	N	N	1.60	2.00	2.80	1.66	1.66	2.66	3.14	23	80
80	2.80	1.40	4.20	2.14	1.57	3.71	N	N	N	1.80	1.60	2.40	1.33	1.33	2.66	3.24	21	80

Environmental Barriers: PS – Physical / Structural; SA – Service / Assistance; W – Work; AS – Attitude / Support; PO – Policy.

Scores: FREQ – Frequency; MAG – Magnitude; IMP – Impact.

Scales: CHIEF – Craig Hospital Inventory of Environmental Factors; LSNS – Lubben Social Network Scale; BI – Barthel Index.